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JOURNAL OF
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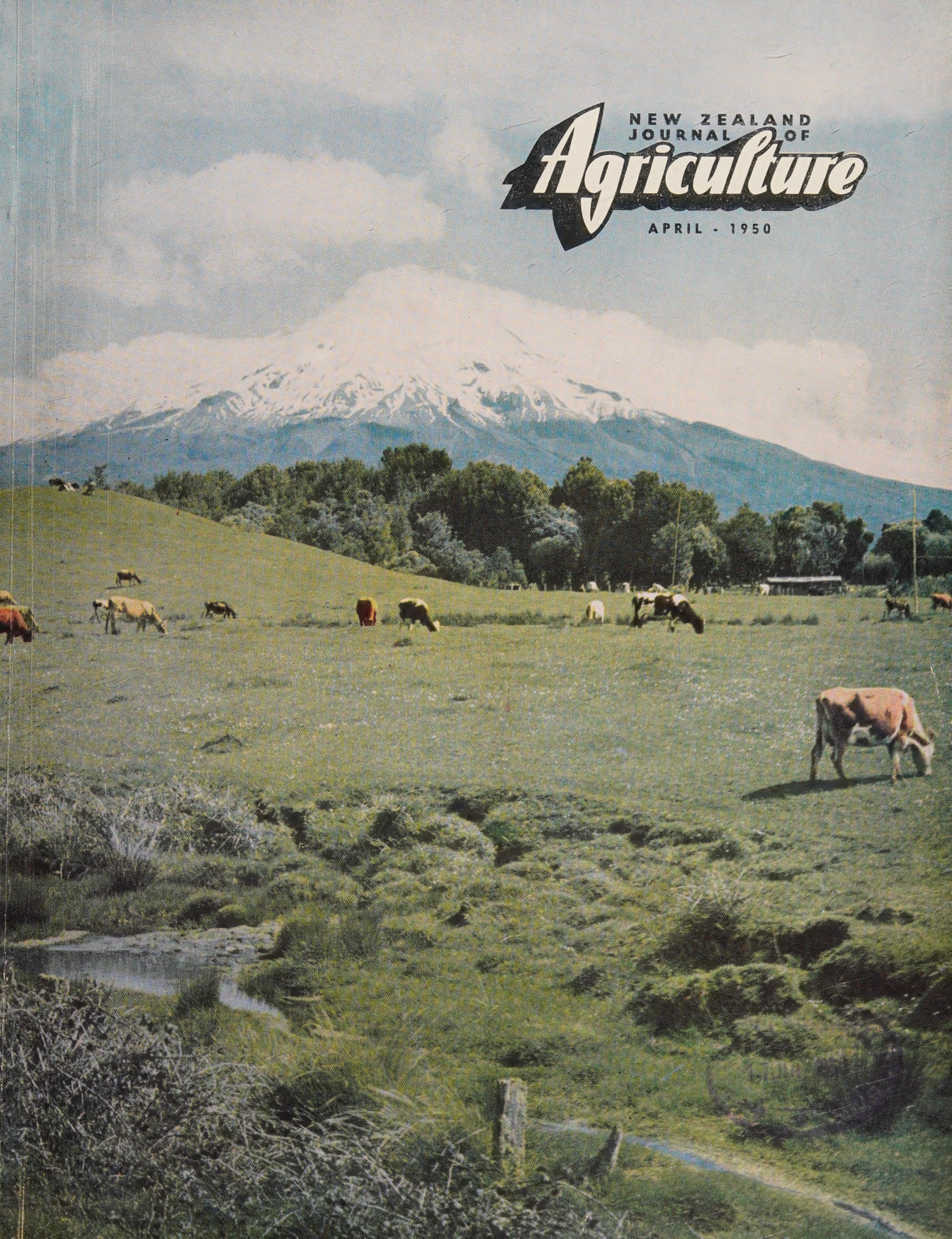

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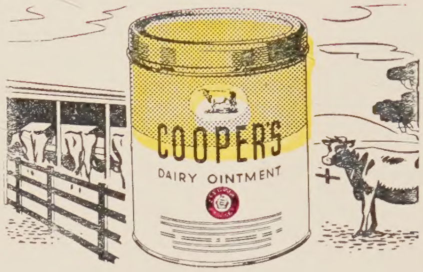

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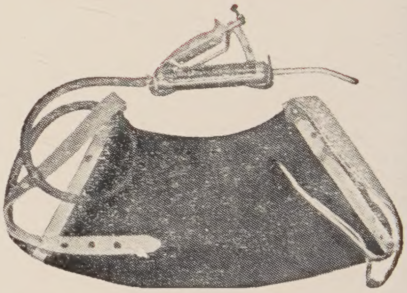

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This month's cover

No other farming area in New Zealand is so dominated by a single topographical feature as is Taranaki by Mt. Egmont. This month's cover, which has been reproduced from a natural-colour photograph by National Publicity Studios, shows the mountain fronted by farm lands near Stratford. Taranaki is the largest cheese-producing province in New Zealand, and 52 per cent. of the Dominion's cheese exports are produced on farms within sight of Mt. Egmont. Of the 111 dairy factories in Taranaki 91 are cheese factories. Though considerable quantities of butter are manufactured in Taranaki, cheesemaking has taken precedence there from the days when the first factories started operations.

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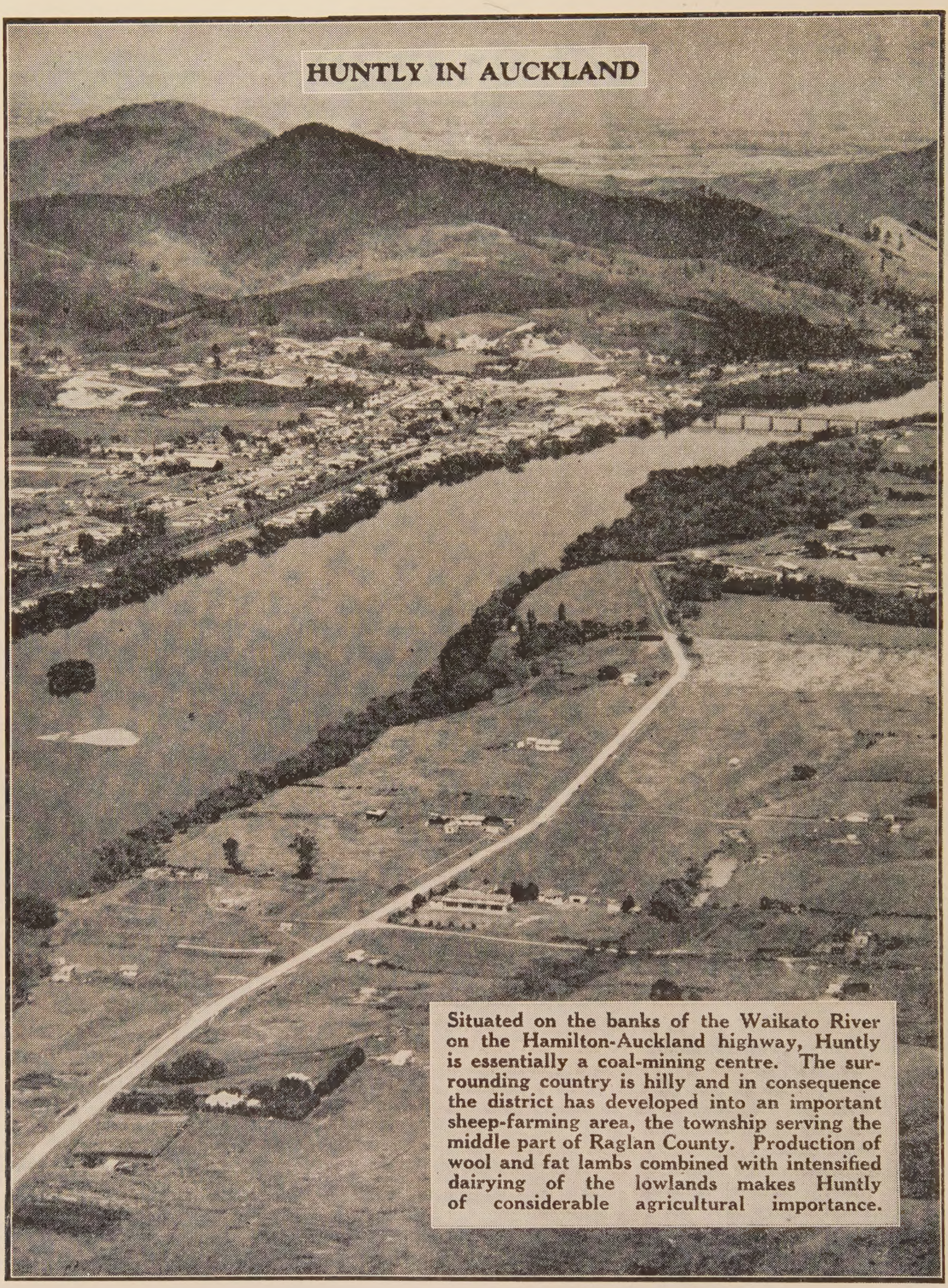
HUNTLY IN AUCKLAND



Situated on the banks of the Waikato River on the Hamilton-Auckland highway, Huntly is essentially a coal-mining centre. The surrounding country is hilly and in consequence the district has developed into an important sheep-farming area, the township serving the middle part of Raglan County. Production of wool and fat lambs combined with intensified dairying of the lowlands makes Huntly of considerable agricultural importance.

[V. O. Browne photo.

Increased Acreage of Wheat Desired

As the season for autumn and winter wheat sowing has now almost arrived, I wish to make a special appeal to all farmers on suitable land to increase their areas of wheat in the 1950-51 season and to plan that in future years New Zealand produces the bulk of its wheat requirements. To encourage that development the Government has approved the payment at the farmer's station of an incentive price of 9s. 9d. a bushel in the South Island and 10s. 10d. in the North Island. This price should be an inducement to farmers to bring wheat back to its former important place as the main cash crop in rotational-farming practice. It should also cause farmers in districts where wheat is not grown to a large extent but where it can be grown and harvested satisfactorily to give serious thought to introducing it into their farming programmes. In such districts as Hawkes Bay, Wairarapa, Marton, Southland, and South Otago an extension of wheat growing should now prove quite profitable.

The potential wheat-growing areas of New Zealand where soil and climate are suited to the crop total more than 5,000,000 acres. Of this, about 1,500,000 acres lie in the Manawatu-Rangitikei, Wairarapa, and Hawkes Bay districts, where the soil is fertile and almost all of it in fit condition for wheat production. In Southland and Central and South Otago the potentialities for expansion are considerable, but usually only small acreages are sown. In some of the areas mentioned in both Islands the climate is not as suitable for harvesting as in the main wheat-growing districts, but that is compensated for in part by the higher yields usually obtained. In the main wheat-growing areas about 2,500,000 acres of land are suitable in every way for the crop, so that there is ample land from which to choose. In this area literally thousands of acres of pasture require renewing, and the new price should be a great incentive to farmers to break them up and take a crop of wheat before resowing.

Effect on Fertility

In periods of low prices such as obtained in the 1880's and 1930's some farmers cropped too heavily with wheat and lowered the fertility of their land. That has led to over-emphasis of the depletion of soil fertility by wheat growing.

No such exhausting procedure need occur in the present campaign for increasing production. If wheat is taken once in the rotation—or even twice on heavy land—there can be no possibility of any real lowering of soil fertility. With the use of improved strains of grasses and clovers and the more general application of lime and fertilisers, rotational cropping is now an excellent fertility builder, and the growing of wheat in a suitable rotation undoubtedly is sound farming.

Livestock Production Need not Suffer

An expanded wheat-growing programme should not lessen production of lamb, mutton, and wool to any appreciable degree. Rotation pastures more quickly renewed will have a higher carrying capacity, and greater wheat production will lessen the cost of producing the winter and summer supplementary feeding crops which are necessary for fat-lamb production under South Island rotational-farming systems. Indeed, as already pointed out, large areas of good wheat-growing land now in moderate pasture would benefit from being ploughed, cropped, and resown in grass.

Benefits of Research

An immense amount of research work has been carried out with the aim of improving wheat production. The Wheat Research Institute has bred improved strains and varieties that have been tried out and introduced into farming through the field staff of the Extension Division of the Department of Agriculture, which has also carried out manurial trials in all important wheat-growing areas. The Division has investigated crop rotations and cultivation methods which may lead to more efficient wheat production. In fact, probably about no other crop in the Dominion is more knowledge available to promote efficient production.

The knowledge that the Department of Agriculture has accumulated is at the service of every wheat grower through his local Instructor in Agriculture. The most important points about such aspects as place in rotation, cultivation, seeding, varieties, and fertilisers have been set out recently in the monthly Seasonal Notes in "The Journal of Agriculture."

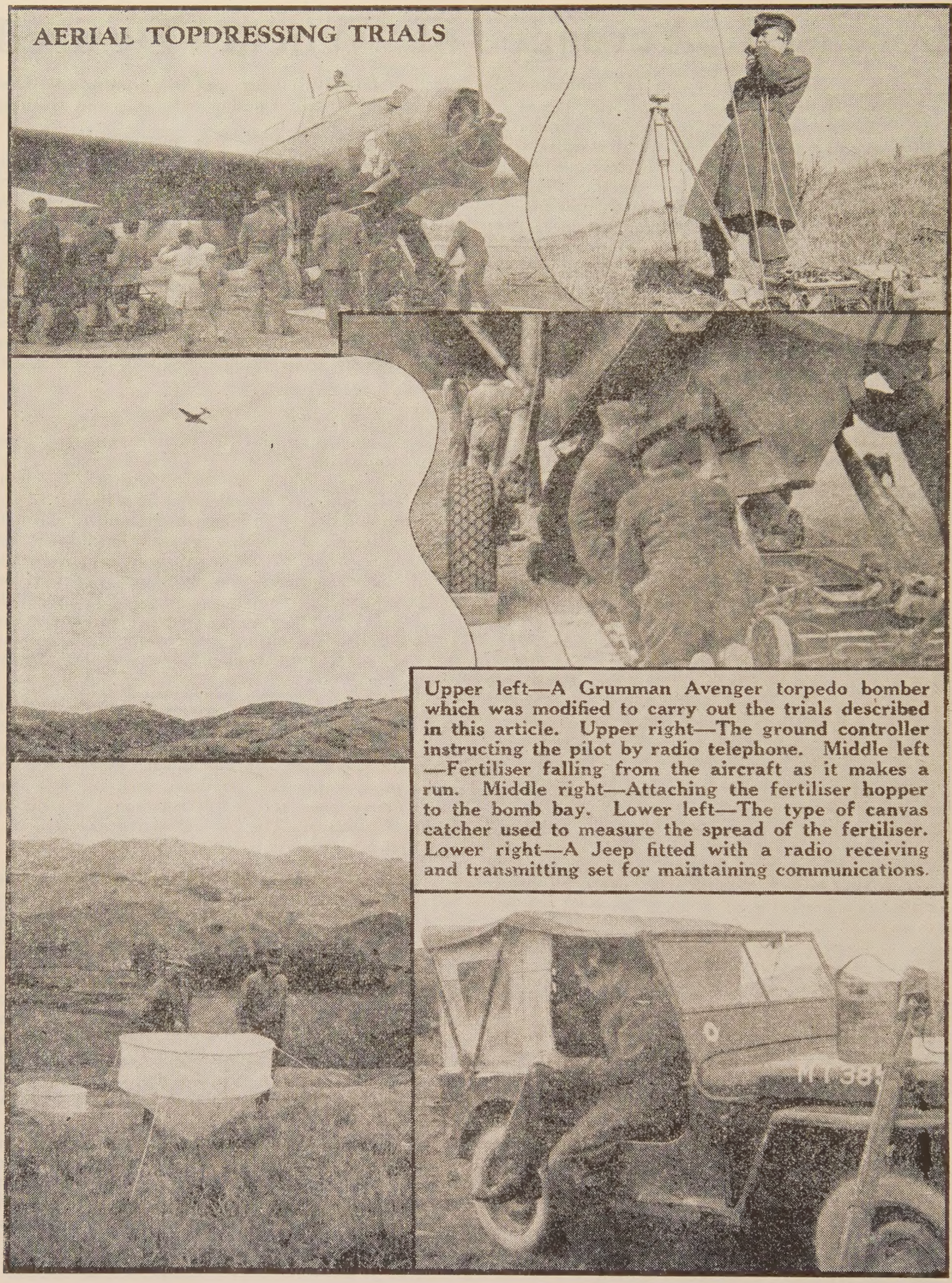
Harvesting

To be self-sufficient in wheat New Zealand would require to have at least 350,000 acres in the crop every year. To those who would suggest that the harvesting of a crop of that size would present insuperable difficulties, the fact that more than 400,000 acres were grown and harvested in the country nearly 60 years ago, without the aid of any of the modern appliances available today, should be sufficient answer. A great increase in the numbers of tractors and header harvesters on farms made possible an expansion of cereal production during the war, and since then much more and still better equipment has come into the country.

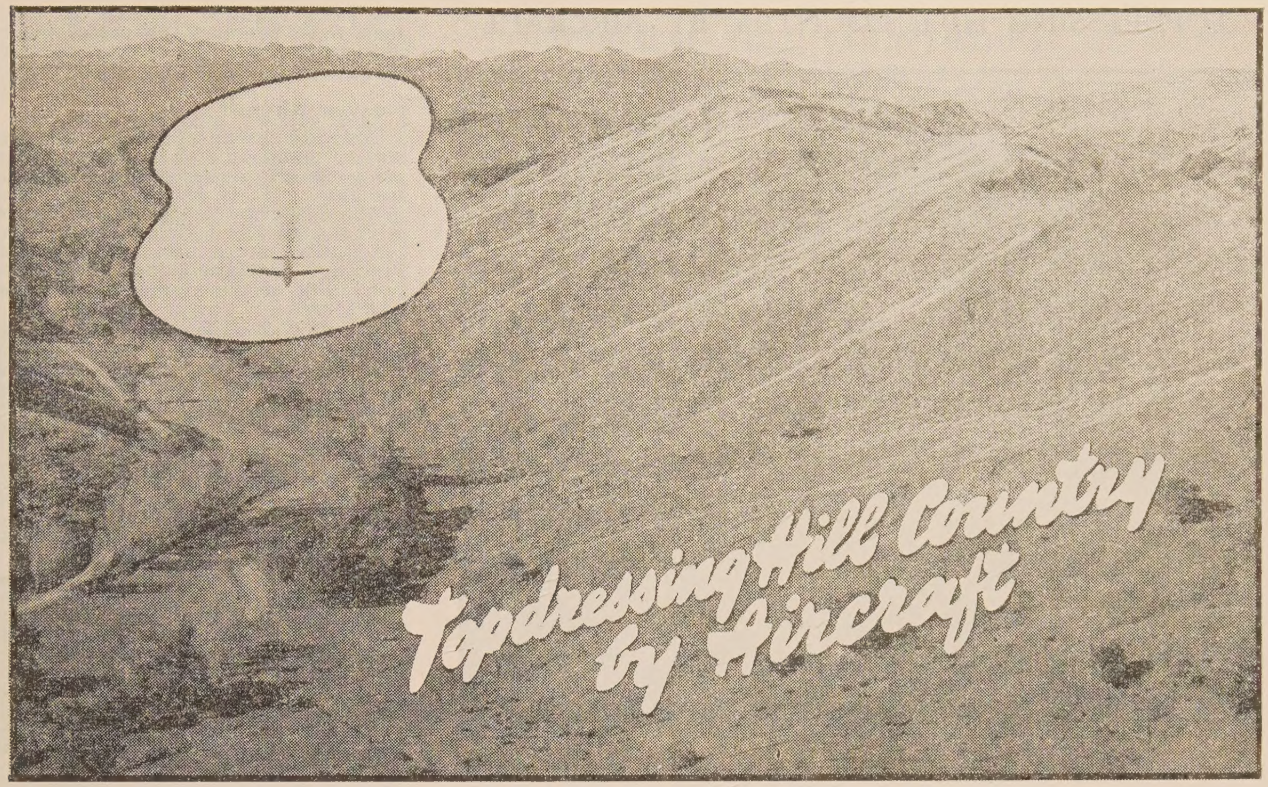
By granting this incentive price the Government has shown that it is earnest in its desire and efforts to make New Zealand more self-supporting in wheat, and I confidently appeal for a response to the Government's action from every farmer who is able to grow more wheat.

K. J. HOLYOAKE, Minister of Agriculture.

AERIAL TOPDRESSING TRIALS



Upper left—A Grumman Avenger torpedo bomber which was modified to carry out the trials described in this article. Upper right—The ground controller instructing the pilot by radio telephone. Middle left—Fertiliser falling from the aircraft as it makes a run. Middle right—Attaching the fertiliser hopper to the bomb bay. Lower left—The type of canvas catcher used to measure the spread of the fertiliser. Lower right—A Jeep fitted with a radio receiving and transmitting set for maintaining communications.



Topdressing Hill Country by Aircraft

By P. B. LYNCH, Crop Experimentalist,
Department of Agriculture, Wellington.

THE importance of hill-country pastures to the farming economy of New Zealand has rightly received increasing attention in recent years. New Zealand must "look to the hills," for the prosperity of the country as a whole is linked with the well-being of the hill-country farmer. And the hill-country farmer is faced with a number of difficult-to-solve problems, some of them economic, some social, but the most important concerning the land—its productivity and conservation, and reversion of its pasture cover to weeds and worthless scrub.

TOPDRESSING with fertilisers alone will not automatically solve any one of these problems. Wholesale distribution of fertilisers from the air might even do more harm than good if the impression was formed that it would automatically result in increased production and reduced soil erosion. At the least it would be to a large degree a waste of valuable fertilisers. Topdressing must be accompanied by adequate subdivision and efficient grazing management to control the extra growth produced, and it must be carried out on a soil and on a pasture which will respond to treatment.

Most hill-country soils respond to phosphatic topdressing and many of them to lime as well. Though the liming of hills is not economically feasible in most cases, soils responsive to lime usually respond to basic slag or North African phosphates if not to superphosphate. It is possible that certain restricted areas would respond to potash fertilisers. Nitrogen deficiency is widespread, but the answer is not necessarily provided by nitrogen fertilisers but rather by the introduction or stimulation of desirable clover species in the sward.

The pastures which are topdressed must contain clovers in addition to the grasses found in hill country if a worthwhile response to fertilisers is to be obtained. If desirable clovers are lacking, their introduction by surface seeding should accompany topdressing. Though the establishment of such surface-sown clovers is by no means certain, in most cases results are sufficiently good. One of the major problems awaiting solution is the uncertain establishment of plants from the surface sowing of clover seeds, but that fact should not hinder the practice of oversowing clovers in association with topdressing.

Hand Topdressing

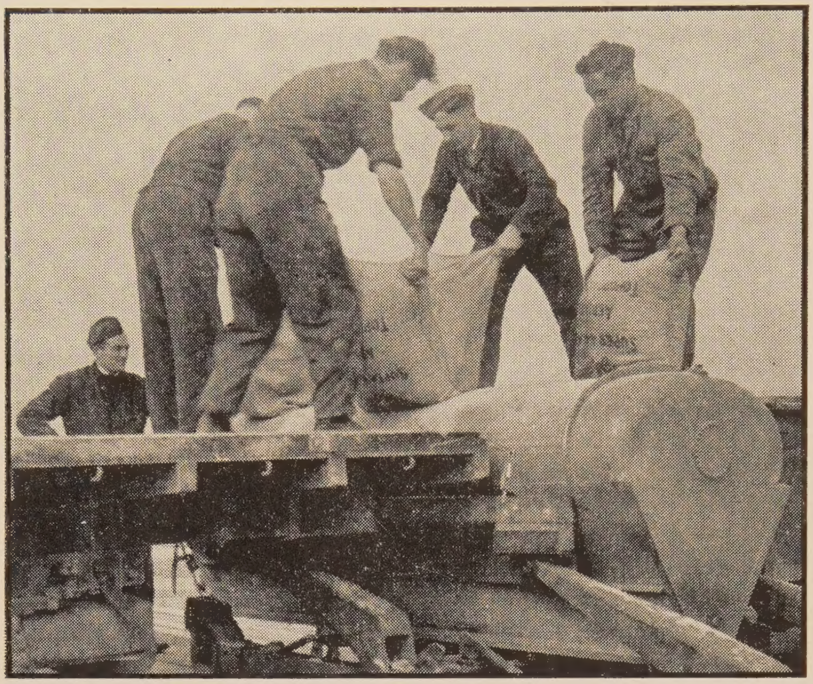
The oldest and still the most common method of distributing fertilisers on land too steep or too broken to allow the use of machines is hand topdressing. The obvious defects of the method are that it is laborious, time consuming, and expensive. Where the productive value of the land is low the high cost of topdressing by hand is a most serious limiting factor, but even where this does not apply labour for the work is usually inadequate. Inexperienced and careless workers far too often give a grossly uneven distribution of fertilisers. This factor cannot be evaluated accurately because it is so variable, but it is one which must lead to a large wastage of fertiliser.

There is no ready method of overcoming these defects, though efficient labour would do much to minimise them, but to cope with the expansion in hill-country topdressing which must be forthcoming if hill-country deterioration is to be arrested, it appears that alternative methods of distribution must be sought. Blower-type topdressers and aircraft provide two such alternatives.

Blower-type Topdressers

A note about blower topdressing equipment appeared on page 452 of the May, 1949, issue of "The Journal of Agriculture." The machines blow finely divided material into the air so that it is dispersed by the wind. A method such as this, dependent on the vagaries of the wind, cannot give accurate distribution of fertiliser, but from observations in hill country it would seem to give a reasonably satisfactory spread. Recent detailed measurement trials of the spread given by these machines from a fixed point were conducted at Flock House, Bulls. The full story of the trials will be published later, but they showed that a reasonable spread can be secured only by using finely ground materials.

TOPDRESSING HILL COUNTRY BY AIRCRAFT



Pouring fertiliser into the hopper which is to be attached to the bomb bay of the aircraft.

Blower-type topdressers appear to offer a useful method for hill-country topdressing, but they still require that fertiliser be transported to the farm and to fixed distribution points around the farm (say one point to every acre), and this is not always easy. The machine must also be transported about the farm. The distribution of fertiliser depends largely on the skill of the operator and the vagaries of the wind, and some material which becomes completely airborne must be wasted. However, costs of application are considerably lower than those of hand topdressing and the labour requirement is less, and no doubt an increasing number of machines will be used in future.

Light Aircraft

The aerial topdressing work of the Royal New Zealand Air Force, acting through a committee of Government Departments set up by the Soil Conservation and Rivers Control Council, stimulated interest by private operators in the possibility of topdressing fertiliser materials from light aircraft, and a rapidly increasing number of operators is now undertaking this work. Detailed measurements of spread of fertiliser by this means have not yet been undertaken, but skilled pilots flying at low altitudes appear to be able to give satisfactory coverage of the ground with commercial fertilisers.

With the comparatively light loads possible—only a few hundred weight—the planes must operate from a landing field close to the scene of operations, and 3 miles has been suggested as the maximum economic distance between the landing field and the topdressing area. This restricts the area which can be topdressed from light aircraft, for suitable landing fields are not easy to find in much of the hill country of New Zealand.

Nevertheless, the enterprise of pilots and farmers in this field is highly commendable and will do much to extend the area of hill country topdressed in New Zealand. Small-scale, individual-paddock operations are possible, and the light aircraft can give a flexibility in time and area which is not possible with any scheme involving the use of heavy aircraft. However, for a national or large-scale scheme of topdressing aeroplanes with a much larger payload and longer economic flying range are required.

Costs of topdressing from light aircraft are considerably lower than those of hand topdressing. At present, contract rates for a dressing of 2cwt. per acre vary from about 7s. 6d. to 10s. per acre according to the number of days of flying weather likely in the area. Costs may even be reduced to the point at which light aircraft will be able to compete with other means of mechanical distribution on flat land.

When rate per acre applications are low, such as with cobalt (1) or copper (2) topdressing or with surface seeding of clovers or grasses, light aircraft are entirely suitable and can operate at very low costs per acre, but when the rates required increase to more than 1cwt. per acre the useful sphere of operations of light aircraft becomes restricted.

Heavier Aircraft

Toward the end of the war interest was aroused in the possibility of using aircraft as fertiliser topdressing machines. Mr. G. H. Cooper, a farmer in the Gisborne district, in association with the late V. P. Boot, then Instructor in Agriculture, made valuable preliminary investigations into the possibility of the method in the Gisborne area.

The Soil Conservation and Rivers Control Council became interested in the project about 1947 and, working through the Inter-Departmental Advisory and Co-ordinating Committee on Aerial Distribution of Fertiliser and Seeds, arranged preliminary trials at Raglan and Ohakea in 1948 (3). The Royal New Zealand Air Force had previously investigated the ballistic problems involved and had designed a hopper and release mechanism for the trials. For the original trials a Grumman Avenger torpedo bomber was modified by the R.N.Z.A.F., a detachable fertiliser hopper carrying about a ton of fertiliser being made from a reserve petrol tank and fitted into the bomb bay. The Department of Agriculture has been responsible for measurements of fertiliser distribution on the ground and for following up the response of the pasture to the fertilisers dropped.

Ohakea Trials: September, 1948

These consisted of several runs across the concrete runways of Ohakea aerodrome by the Avenger at various heights. The spread of the fertiliser was judged by sweeping up the material on the runways, the hexagonal blocks of which the runways are constructed being used as sampling units. Campbell (3) concluded from these trials that an aircraft flying 400ft. above the ground and making parallel flights 90ft. apart would apply 2 to 2¼cwt. of fertiliser per acre.

It was found that granular material was essential, as a considerable proportion of the finer fractions of commercial superphosphate never reached the ground—at any rate, near the target area—and discharge of such material from the hopper was erratic. Such a limitation does not appear to exist with light aircraft flying, say, 50 to 100ft. above the ground; under such conditions, particularly with a cross-wind to disperse the fertiliser, ordinary commercial superphosphate has been used to give a reasonably satisfactory distribution as far as can be judged without measurement.

Raglan Trial: October, 1948

This was an attempt to topdress steep hill country on the farm of the late Mr. J. B. Vowles at Te Mata, near Raglan. Unfortunately, the trial was marred by the fact that the screened superphosphate used contained a high proportion of finer particles, so that it packed in the hopper and did not flow freely during the topdressing runs. The measurements consequently

---

1. Andrews, E. D., and Prichard, A. M.: "Topdressing Cobalt-deficient Land from the Air," "The New Zealand Journal of Agriculture," November, 1947, page 501.

2. Cunningham, I. J., and Anderson, O. J. C.: "Bluestone Topdressing from the Air," "The New Zealand Journal of Agriculture," September, 1946, page 193.

3. Campbell, D. A.: "Preliminary Aerial Distribution Trials with Superphosphate and Seeds Mixtures," "The New Zealand Journal of Science and Technology," August, 1948, Section A, page 65.

revealed grossly uneven distribution, and the mean application rate was about 140lb. per acre instead of the 2cwt. which was the aim.

However, the trial showed that a granulated material with particles of known diameter was essential. Material which passed a ⅜in.-mesh sieve but was retained by one of ¼in. mesh was found to be satisfactory. The hopper was redesigned with the sides set at 60 degrees and a high-frequency vibrating rod was installed inside the hopper to obviate packing of the fertiliser and to ensure an even discharge. The trial also led to improved flight control of the aircraft from the ground, and a system of two-way radio communication was devised by the Air Force for this purpose. In addition, a suitable type of seed hopper was designed and both forms of hopper were incorporated in the aircraft used in the large-scale trials in the Wairarapa.

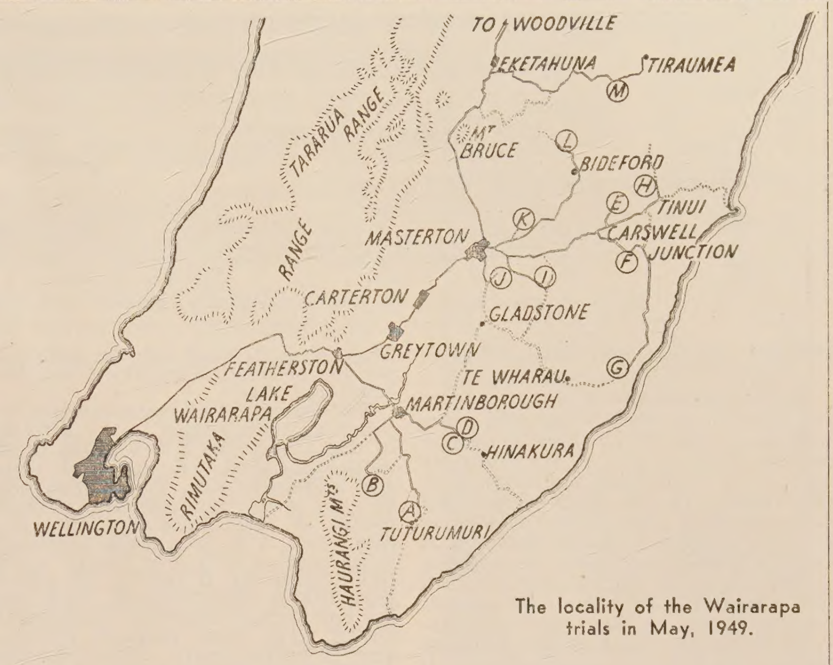
Wairarapa Trials: May, 1949

For these trials the facilities at Hood Aerodrome, Masterton, were made available by the Wairarapa-Ruahine Aero Club to the R.N.Z.A.F., which controlled flying operations. A total of 120 tons of double-screened hillside superphosphate was dropped on the properties of 13 farmers, who met the cost of the fertiliser (and in some cases of seed), the cost of spreading being a charge against the Soil Conservation and Rivers Control Council. Distribution was measured by the Department of Agriculture, using special canvas catchers each collecting an area of 1 sq. yd. A local sub-committee representing Federated Farmers, the Wairarapa Catchment Board, the Department of Agriculture, the Department of Lands and Survey, and the aero club was responsible for local arrangements.

Areas were selected to give a good coverage of the district and its soil types. They ranged from 50 to 80 acres each and in all cases the nature of the field made topdressing it with the usual implements impossible. Details of properties treated are shown with the map on this page.

Two aircraft were used and a shuttle system was operated in flying the areas. The detachable fertiliser hoppers used made refilling relatively simple, and a third hopper would have permitted a faster turn-round of the aircraft. Ground-air two-way communication was maintained on the target areas, the ground party directing the aircraft into flight lanes and giving the signal for the release of fertiliser. Flight lanes were planned to be 2 chains apart in parallel lines across the field to be topdressed. Difficulties such as varying speeds and directions of winds and broken terrain caused modifications in the original plan from time to time.

Measurements of spread were made at the Wardell Estate, Te Whiti, and on the properties of Messrs. H. Morrison, Awatoitoi, R. Cameron, Wangaehu, L. T. Daniell, Wairere, I. A. Speedy, Tinui, and F. B. Tatham, Homewood, and finally a lime application was made on Mr. Daniell's farm. In early trials distribution was not satisfactory and in some cases variations were recorded of from nil to 11cwt. per acre within 50yds., with a large percentage of the ground not treated. However, with improved flying technique and ground control, distribution improved markedly, and on the farm of Mr. Tatham at Homewood the spread of fertiliser over the measured area could be considered quite satisfactory and probably considerably better than is achieved in most cases with hand topdressing. The dressing aimed at was 2cwt. per acre, and on the measured area a mean of 2.1cwt. was recorded with a range of from nil to 5.7cwt., but only 9 of 48 catchers gave less than 0.5cwt. per acre.



The locality of the Wairarapa trials in May, 1949.

Distinguishing letter	Order of treatment	Owner of property	Area treated (acres)	Superphosphate (tons)	Seed per acre
A	8	J. A. McLeod	80	10	None
B	12	J. A. McDougall	60	8	None
C	13	Department of Lands and Survey	50	7	None
D	11	R. E. Spooner	80	10	None
E	6	W. G. Groves	80	10	None
F	2	H. Morrison	80	10	2lb. of subterranean clover, 1lb. of white clover
G	10	F. B. Tatham	80	10	White clover only
H	9	I. A. Speedy	80	10	None
I	5	Rawhiti Farms Ltd.	80	10	None
J	1	Wardell Estate	80	10	2lb. of subterranean clover, 1lb. of white clover
K	3	R. Cameron	80	10	None
L	4	L. T. Daniell	80	10 plus 10 tons of lime	2lb. of subterranean clover, 1lb. of white clover
M	7	R. Kebbell	80	10	None

The spread of clover seed was not determined accurately, but appeared to be considerably poorer than that of the screened superphosphate. The different densities, sizes, and shapes of clover seed are reflected in a band distribution when the seed is dropped from a height, the small, light, white clover seed drifting considerably further than subterranean clover seed and falling as a band to one side of the subterranean clover. With grass seed this winnowing effect is much more pronounced. Though overlapping of runs will overcome this faulty distribution to some extent, it would appear that some form of pelleting light seed is desirable so that it falls similarly to the granules of superphosphate. The larger and heavier subterranean clover seed is much more satisfactory in this respect.

The Wairarapa trials were conducted on a large scale and clearly indicated that no mechanical or ballistic problem that could not be overcome was associated with aerial topdressing. The method of applying superphosphate was shown to be entirely practicable and, though it could not be conclusively shown because of the experimental nature of the work, the trials indicated that costs of application with aircraft more suited to the work than those used would be competitive with those of other means of distribution.

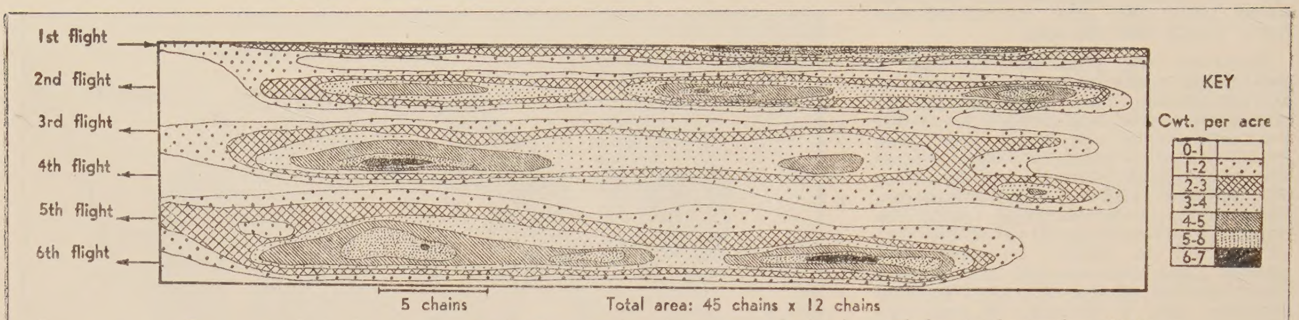


Fig. 1—A chart showing the distribution density obtained in the trial at Ohakea in September, 1949.

Detailed Measurement Trial, Ohakea: September, 1949

The measurements of distribution of fertiliser in the Wairarapa trials were not of a type which gave a precise picture of the spread obtained, mainly because of difficulties associated with the setting up of catchers on hill country. Therefore it was decided to conduct a detailed trial on flat land at Ohakea aerodrome under good flying conditions, using skilled pilots and all the refinements in flying and ground-control technique that had been developed, together with an accurate and detailed measure of distribution. All these factors were obtained in the September trial and a detailed analysis of the results was possible (4). Three sets of measurements were obtained using both the special canvas catchers and the aerodrome runways as sampling units; 48 acres was topdressed.

The first set of measurements was designed to obtain the general distribution pattern and was secured with a "grid" of samplers. The distribution density chart (Fig. 1) shows the pattern that was obtained. A general mean density of 2.7cwt. of fertiliser per acre fell over the sampling area. The frequency of occurrence of sampling values, excluding those on the four borders of the trial, was: 0 to 1cwt. per acre, 25 samples; 1 to 2cwt., 7; 2 to 3cwt., 12; 3 to 4cwt., 14; 4 to 5cwt., 10; 5 to 6cwt., 5; 6 to 7cwt., 5; and 7 to 8cwt., 2—a total of 80 samples. The chart shows plainly the striated pattern parallel to the direction of flight and also the tendency for the fertiliser lanes to merge in pairs on some occasions and give relatively wide gaps between the pairs of lanes. These gaps account for the high proportion of samples receiving less than 1cwt. per acre.

The second set of measurements was taken at right angles to the direction of flight, and Fig. 2 is a graph of the values obtained. A series of waves was expected, with the highest point of each wave corresponding with the centre of each flight lane, but it is clear that A in the graph represents a merging of two such waves, shown individually by B and C. Therefore only the B and C waves were used in computing expected distribution waves. The flight lanes in this trial were 2 chains apart. Using the data from waves B and C, which were found to fit most closely to parabola, it was possible to calculate the distance apart the flight lanes should have been to get the most efficient distribution.

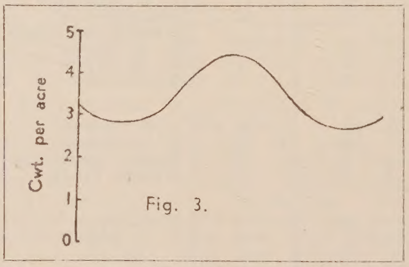


Fig. 3.

Fig. 3 shows the wave resulting from fertiliser being dropped at five-sevenths of the original rate (which was 3.5cwt. per acre at the point of cross-section at which the measurements were made) and a distance of 1 3/7 chains between flights. Fig. 4 shows the almost perfect distribution with a dropping rate of four-sevenths of the original and 1 1/7 chains between flights. It is clear from this set of measurements that, with accurate flight control and the use of granular material, almost perfect distribution can be obtained with close spacing of flight lanes. The spacing to be adopted will depend on several factors, only one of which is accuracy of spread, for the closer the flight lanes the higher will be the cost of topdressing per acre.

The third set of measurements was taken along the line of flight to investigate changes in dropping rate as the fertiliser hopper emptied. These measurements showed an increase in rate from nil to 4cwt. per acre within 190ft. of the falling of the first particles and thereafter no suggestion of a rise or fall in rate of application, though the samples at the end of the run were blown away by the aircraft landing too close to the measuring area. There did appear to be more irregularity between weights of samples toward the end of the run, possibly indicating a more even delivery from the hopper when full than when nearly empty.

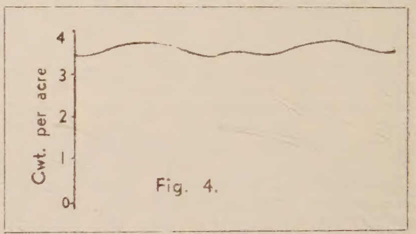


Fig. 4.

This trial showed clearly the distribution obtained with the equipment developed to date and indicated that, in reasonable weather, degree of flying skill and efficiency of ground control were the major factors causing variations in distribution. If these were perfected, practically any desired distribution could be obtained. The spread of fertilisers obtained when the aircraft flew in lanes 2 chains apart, though by no means perfect, was probably a great deal better than would be secured with most hand or blower topdressing.

Topdressing land with fertilisers from aircraft has been shown to be practicable and there is every chance that a rapidly increasing area will be topdressed by such means in future. No doubt for some years light aircraft will be the machines used most, and they will always find a place in any aerial topdressing scheme. Eventually, however, the larger aircraft will probably assume increasing importance, especially in the back country, where haulage to the farm or to its vicinity is a large item in topdressing costs.

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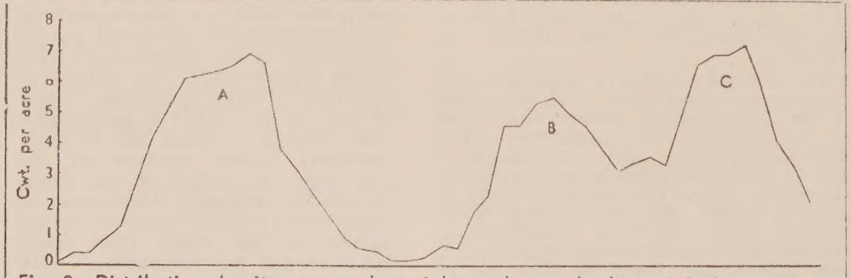

Fig. 2—Distribution density measured at right angles to the line of flight in Fig. 1.

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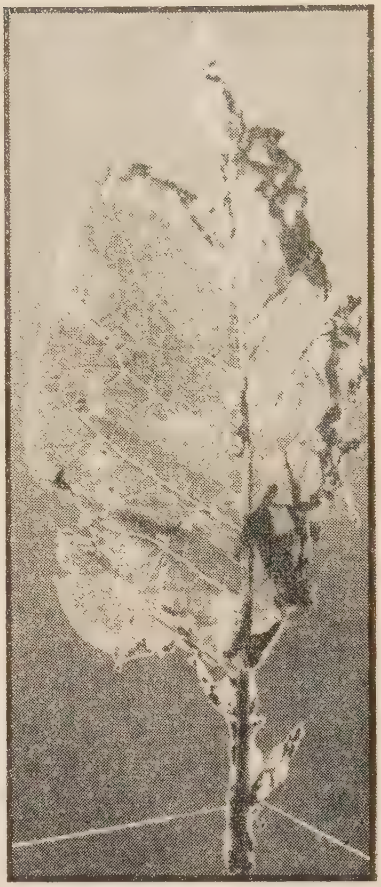
4. Miller, J. G.: "Measurement of the Distribution of Granular Superphosphate from Aeroplanes," a paper submitted to "The New Zealand Journal of Science and Technology."

Tobacco Crops Severely Damaged by Tobacco Leaf Miner

SOME pests of cultivated plants often regarded as of little economic importance in certain hosts may under favourable conditions assume such dangerous proportions that they threaten whole crops. A pest commonly known as the potato tuber moth or tobacco leaf miner normally causing only minor damage to tobacco in New Zealand was responsible for such havoc to this crop in one area in the Nelson district this season that two fields of tobacco had to be destroyed and adjacent tobacco crops were so threatened that control measures became necessary. This article by N. J. Adamson, Horticultural Superintendent, Department of Agriculture, Nelson, describes the pest and the type of damage it may cause and gives suggestions for its control in tobacco crops.



A nearly mature tobacco leaf damaged by the larvae of the tobacco leaf miner.

THE larvae of the potato tuber moth (*Gnorimoschema operculella* Zell.) are best known for the damage they cause to potatoes by boring into tubers both in the field and in store.

In tobacco damage is caused to young plants in the field. Although the moth has been known for some time as a pest of tobacco in New Zealand, normally it is not so numerous that it causes appreciable damage. Damage has usually been confined to the lower leaves or "lugs," regarded as of little value in any case and often discarded.

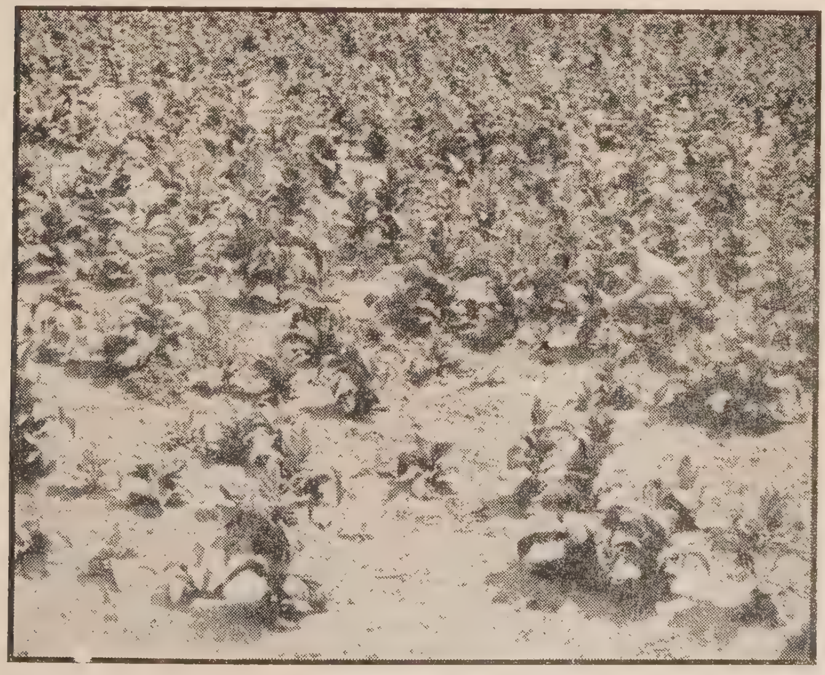
A severe outbreak of the pest occurred at Pokororo in the Motueka River district this season and demonstrated what a threat to the tobacco-growing industry it could become if given the right conditions.

Check to Young Plants

The adult moth lays its eggs upon the leaves of tobacco plants, and the young larvae penetrate the surface of the leaf and then begin to tunnel. They will burrow down the midrib of the leaf into the stem and often destroy the growing point. Thus young plants in the field may receive such a check to growth under a severe attack that they become worthless, or may even be completely destroyed. A check through damage to the growing point may force the young plant into lateral growths. Eventually a good plant may be produced, but extra labour is necessary to break out surplus shoots after a lateral growth has been selected to replace the main stem.

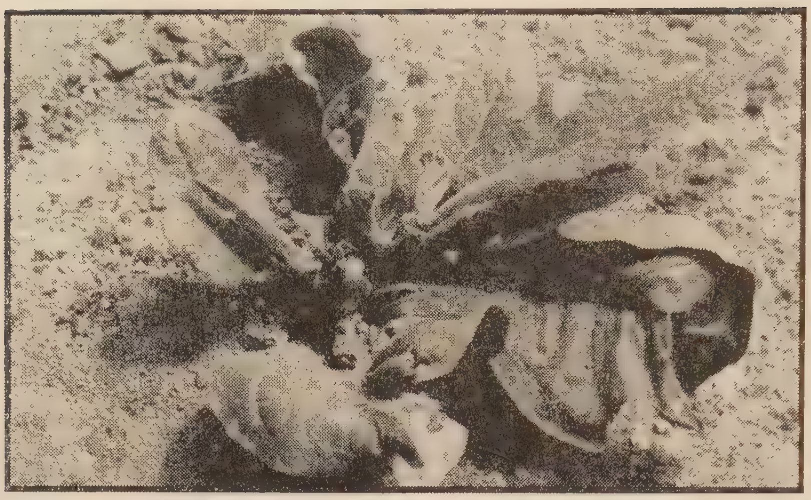
The larvae of the potato tuber moth are from ½ to 5-8in. long. The colour is dirty white with a pinkish or sometimes greenish tinge. The head is dark, occasionally almost black. The larva is particularly active. The mature insect is a small, narrow, brown and grey moth. Breeding is continuous over the warmer months, so that there are several broods in a season. In warmer districts in New Zealand it is likely that the moth would continue its activity over the winter, and, given very favourable conditions, would build up rapidly in spring and early summer. In addition to damaging potatoes and tobacco, the potato moth is known to attack cape gooseberries and such weeds as nightshade and other solanaceous plants.

It is evident that in the recent outbreak a build-up occurred in the remnants of a large tobacco crop of the previous season where, through change of occupancy, the land was not prepared for another crop, but stalks remained. A mild winter in what is a relatively frost-free area permitted a strong growth of weeds and also kept the tobacco plants alive, so that there were green tobacco shoots at the end of July. This set of circumstances provided a carry-over and permitted a rapid build-up to endanger adjacent areas.



Gaps in rows caused by the death of plants and the general unevenness of growth after a severe attack of tobacco leaf miner.

TOBACCO LEAF MINER



A tobacco plant in which the original crown was eaten off and succeeding lateral growths were severely attacked. Note the curled appearance of the central leaves.

This confined outbreak has demonstrated what may provide a dangerous source of infection, and the severe damage which can occur given the right set of circumstances. It may act as a timely warning regarding a pest not previously taken seriously in tobacco growing and emphasises particularly the need for garden hygiene.

Where the pest has been as severe as in this instance a carry-over into next season is likely and precautionary measures should be taken to control it.

Recommended Control Measures

General recommendations are as follows:—

1. In all tobacco-growing areas stalks should be ploughed or disced in as early as possible after the tobacco harvest to remove a breeding ground for moths.

2. In areas where the pest has been severe and a carry-over is likely plants in the seedling beds should be dusted with a 2 per cent. D.D.T. dust. The material may be readily applied by small mechanical dusters or by shaking over the plants a muslin bag containing the dust.

3. For the first month after planting plants should be dusted every week or 10 days with D.D.T. dust applied by a mechanical dusting appliance of a capacity suitable to the area to be treated.

If preventive measures are taken after planting, the tobacco should become well established and grow freely enough to outgrow the effect of what few larvae may have survived, and a full crop may be harvested.

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Radio Broadcasts to Farmers

THE following radio talks will be given to farmers from Station 1YA Auckland at 7.15 p.m.:—

May 3—"Prevention of Lambing Losses," by P. J. McCann, Veterinarian, Department of Agriculture, Hamilton.

May 10—"Current Farming Problems," by J. R. Murray and H. McM. Bull, Instructors in Agriculture, Department of Agriculture, Hamilton.

May 17—"Planting Fruit Trees: When and How," by I. L. Nottage, Orchard Instructor, Department of Agriculture, Auckland.

May 24—"General Aspects of Peat Development and Water Control," by I. L. Elliott, Assistant Superintendent, Soil Fertility Research Station, Hamilton.

May 31—Y.F.C. talk, by G. W. Guy, chairman, Auckland Council of Federation of Young Farmers' Clubs.

The following talk will be given from Station 1YZ Rotorua at 7.15 p.m.:—

May 11—Tauranga District Committee of Federation of Young Farmers' Clubs.

Talks from Station 4YA Dunedin at 7.30 p.m. may be heard as follows:—

May 3—"Wintering of Bees," by I. W. Forster, Apiary Instructor, Department of Agriculture, Oamaru.

May 17—"Some Causes of Poisoning in Animals," by C. V. Dayus, Livestock Superintendent, Department of Agriculture, Dunedin.

May 31—"Turnip and Swede Seed Production," by J. O. Wallace, Seed Production Officer, Department of Agriculture, Dunedin.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m.; 2YZ Napier on Tuesdays at 7.10 p.m.; 2YA Wellington on Thursdays at 12.35 p.m.; and 3YA Christchurch on Mondays at 12.20 p.m.

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BOOK REVIEW

"Farmer's Veterinary Handbook"

SINCE the late H. A. Reid's excellent little book, "The Diseases of Farm Animals in New Zealand," became out of date and went out of print, a reliable work on stock diseases under New Zealand conditions has been lacking.

Certain pretentious tomes on animal diseases have been sold from time to time by persuasive salesmen to members of the farming public, but sometimes they are found to be out of date and often to have little bearing on New Zealand's animal husbandry.

The reviewer, a veterinarian, has read "Farmer's Veterinary Handbook," stated to be by a qualified veterinarian, with pleasure. It would seem that not only does the author write from considerable practical local experience, but that he has been at pains to familiarise himself with the distribution of the various diseases throughout the country and to give the most up-to-date information available concerning each.

One or two points might be mentioned. Whether in the treatment of retained afterbirth in the cow manual removal should be attempted at all times, except in cases showing evidence of toxic absorption; the absence of any reference to phosphate deficiency, though undoubtedly this is much rarer than in the past.

The book is well written and well set out. A clear account of the "mechanics" of each disease as far as are known is given.

Due emphasis is placed on the need for veterinary advice or assistance, but treatments which the owner can apply are outlined.

A pleasing feature is the summary of preventive measures given for each disease and these appear to be in line with modern professional knowledge and opinion.

"Farmer's Veterinary Handbook" can be recommended to young farmers or to anyone in need of an up-to-date treatise on the diseases of farm animals in New Zealand.

—*D.M.*

N.Z. Dairy Produce Exporter Newspaper Co. Ltd. 20s.

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Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in May as follows:—

Rotorua—1YZ, on May 25, at 12.35 p.m., "The Carcass Quality Scheme," by A. F. Barwell, Supervisor, Bay of Plenty District Pig Council.

Wellington—2YA, on May 16, at 7.15 p.m., "Losses from Live Weight to Cured Bacon," by C. M. Bailey, Supervisor, Taranaki District Pig Council.

Christchurch—3YA, at 7.15 p.m., on May 25, "Questions and Answers," conducted by H. W. McIntosh, Supervisor, Canterbury District Pig Council.

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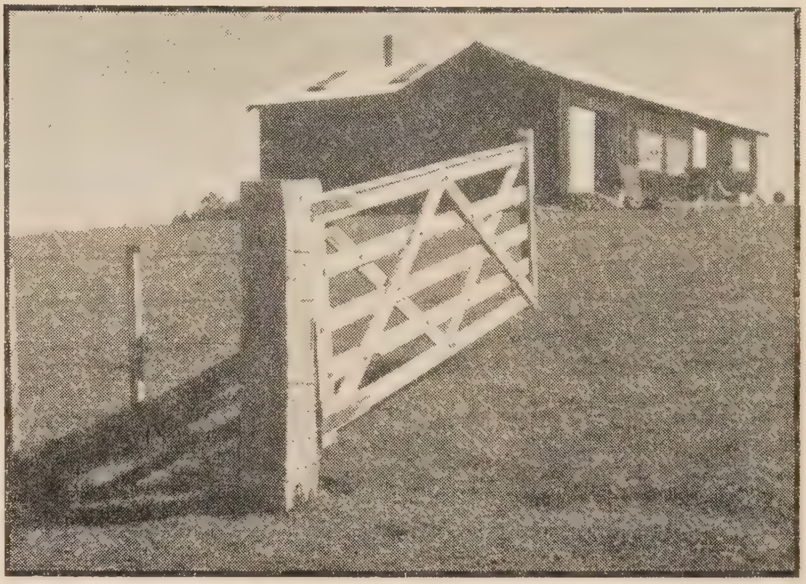
Swinging a Farm Gate on a Hillside

NORMALLY a farmer endeavours to avoid hanging farm gates in difficult positions, but there are times when this cannot be avoided and where it is necessary to provide for a considerable rise of the toe of the gate to clear sloping ground. This article, contributed by I. L. Elliott, Assistant Superintendent, Soil Fertility Research Station, Hamilton, describes various ways of swinging a gate on a hillside.

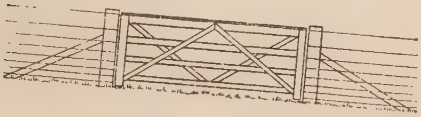

A hillside gate made with an experimental hinge which at the bottom has twin gudgeon pins that slide round the face of a plate fixed to the bottom of the post.

FREQUENTLY a gate has to be swung at right angles to the slope of a hill and, provided that the gate opens downhill, hanging presents little difficulty. Within narrow limits, too, it is possible to alter the angle of the gateposts so that the gate will clear any small slope. Where the slope is considerable and it is necessary to provide for the gate to open uphill special provisions have to be made for hanging the gate in the same direction as the slope of the hill or for hanging it across the slope of the hill.

Gate Hung in Same Direction as Slope

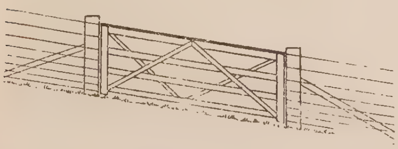
It is probably easier to hang a gate in the same direction as the slope and there are three main ways of overcoming the difficulties involved.

The first method is to adjust the angles of the gateposts as shown here.


Posts set at right angles to slope.

The method consists simply of setting the gateposts at right angles to the surface of the slope, but the method is, of course, practicable only where the slope is very gentle.

The second method is to construct special gates. This method can be used successfully for steeper slopes, but it involves building the gate to compensate for the slope of the hill.


Posts set plumb.

It will be noted that in this case the stiles and rails of the gate are fixed at an acute angle to one another and not at right angles as is normally the case. This is by no means a common procedure and makes construction difficult. The angle of the stile to the rail must be the same as that which the average slope between the gateposts bears to the bottom gatepost.

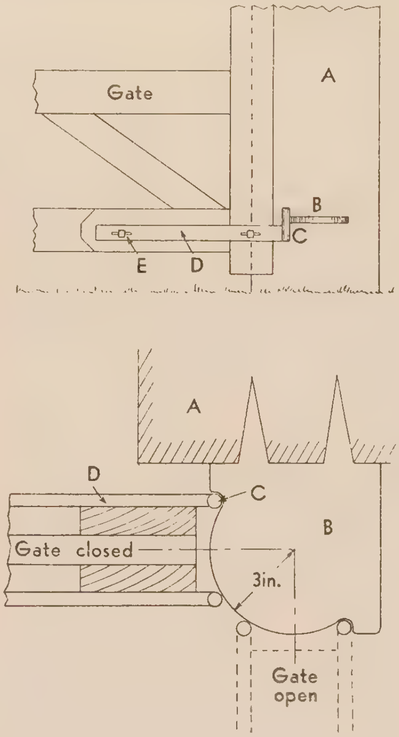
Another disadvantage of this type of gate is that when the gate is fully opened the toe of the gate will lift up high above ground level.

The third method of hanging a gate in the same direction as the slope is by benching. This is undoubtedly the best method and that most frequently used for steep slopes. It consists simply of cutting out of the side of the hill a terrace upon which the gate is hung in the normal fashion for flat land. It may also be necessary to construct special panels from the gatepost to prevent stock from getting past.

Gate Hung at Right Angles to Slope

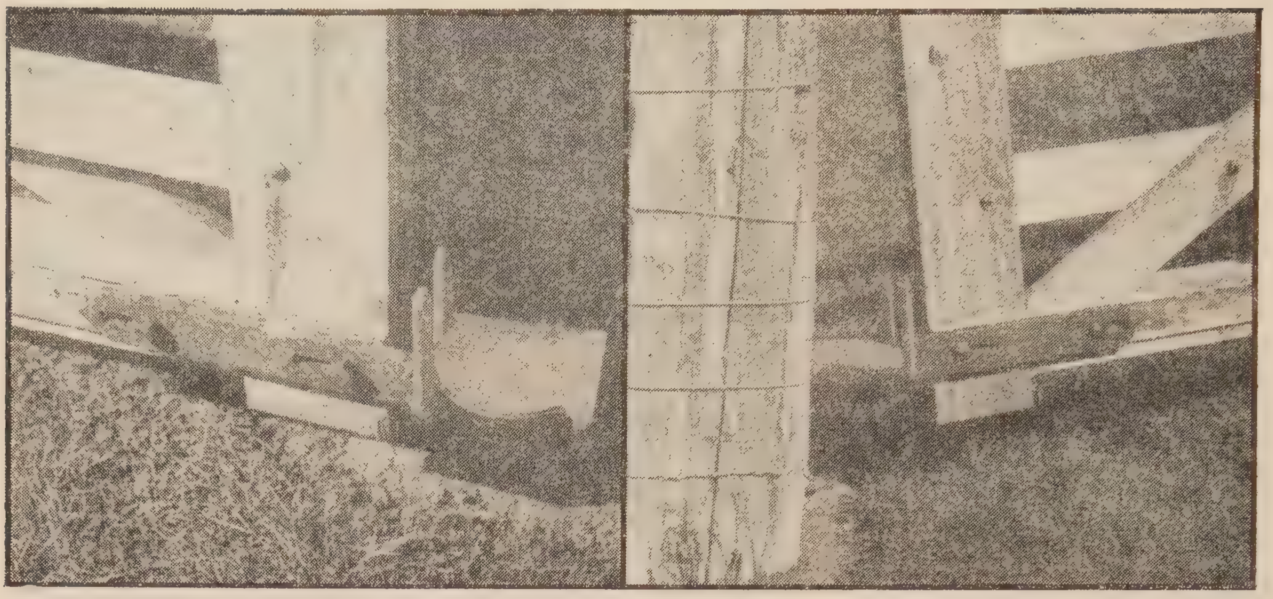
Normally where a gate is hung at right angles to the slope it is swung so that it opens down the slope and consequently does not touch the ground on being opened. However, there may be circumstances in which it is imperative to swing the gate uphill, in which case special provisions have to be made.

The system used is the same in all cases, but there may be many variations depending on the ingenuity of the farmer. Fundamentally the system depends upon the fact that if an adjustment is made in the relative positions of the top and bottom gudgeons, the toe of the gate will rise or fall on being opened. Thus on perfectly flat country the gudgeons occupy a position in which the top one is vertically above that at the bottom. If on a hillside the bottom gudgeon is made to stand out further from the post than the top one, then the toe of the gate will rise on opening. If the gudgeon has to be stood out too far from the post it may be weakened, but this can be overcome by modifying both the hinge and the type of gudgeon used as shown in the accompanying diagrams.



A—Post. B—Plate. C—Gudgeon. D—Strap hinge. E—Slot for adjustment.

It will be noted that instead of providing a single gudgeon, which is fastened into the post, 2 gudgeon pins, fastened into strap hinges, are provided. These strap hinges are slotted so that it is possible to make minor

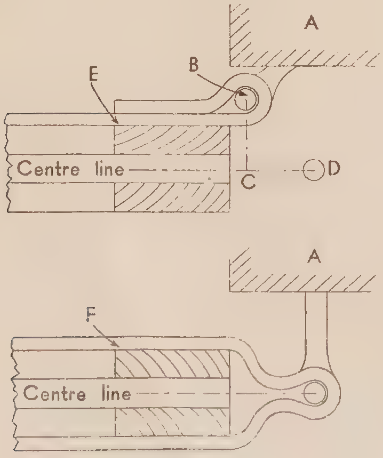


Hillside gate experimental hinge; gate closed (left) and open (right).

adjustments after the gate is swung. This, of course, is not strictly necessary, but it may be helpful in some circumstances.

The twin gudgeon pins mentioned slide round the face of the plate when the gate is opened, and, as they move round the arc of a circle while the top gudgeon occupies a fixed position, this has the effect of causing the gate to lift as it is opened. It will be seen from the illustrations above that the higher the toe of the gate has to be lifted the greater must be the radius of the circle from which the arc is described. A circle of 3in. radius will give a maximum rise of 9in. with an 11ft. gate.

A disadvantage of this method is that, if it is necessary to open the gate right back, it is difficult to make the plate of such a shape that the gudgeon pin does not slide out of position. For this reason it is suggested that special hinges be made as shown.



A—Post. B—Top gudgeon. D—Position of bottom gudgeon. E—Top hinge. F—Bottom hinge. Distance BC = distance CD.

The diagram below shows a modification of the last method and, generally, it is the best method to use. Particular attention must be paid to the relative positions of the top and bottom gudgeons, details of which are shown in the diagram. The bottom hinge is similar in most respects to a normal hinge, but it is made in such a way that the gudgeon pin is a greater distance than normal from the stile of the gate. The disadvantage of this method is that it weakens construction, because the hinge and gudgeon pin project much more than is usual from the gate and post respectively.

Slight Slopes

Adjustments sufficient to overcome slight slopes can be made without any modification of hinge or gudgeon, merely by setting out the bottom gudgeon to the extent necessary to give sufficient rise. However, unless some compensation is made laterally, the gate will be forced out of plumb when it is opened.

Ruakura Farmers' Conference Week

THE need for agricultural research workers and practical farmers to meet and discuss farming problems is recognised and adequately met by the annual Ruakura Farmers' Conference Week, which is to be held at Hamilton this year from Monday, May 15, to Friday, May 19. The conference will be directed by C. P. McMeekan, Superintendent of the Department of Agriculture Animal Research Station, Ruakura, in co-operation with the Waikato Farmers' Educational Committee.

The outstanding success of the farmers' week in 1949 and the wide and sustained interest shown by primary producers in the results being achieved at Ruakura should give an added zest to the proceedings this year, when a well-planned and comprehensive programme will be presented.

The conference is divided into two sections, sheep farming and dairy farming. For the sheep-farming programme, which begins on Monday, May 15, and continues until Wednesday, May 17, authoritative addresses have been arranged on topical subjects, including "Use of Cobalt in the Control of Bush Sickness," "Non-castration of Ram Lambs in Fat-lamb Production," "The Field Diagnosis of Sterility in Rams," "Nutrition of the Breeding Ewe," "Modern Sheep Dips and Dipping Techniques," "Deaths in New-born Lambs," and "Control of Internal Parasites in Sheep."

On the last day of this section of the conference a field day will be held, when sheep farmers will inspect sheep work at Ruakura and at the Ruakura Hill-country Research Station (Raglan). An inspection of Ruakura dairy work will be carried out by dairy farmers on this day.

On Thursday the dairy-farming section will be officially opened and will continue until Friday with lectures and discussions on subjects of vital interest. These include "Some Common Poisoning Problems on Dairy Farms," "Overseas Development in Milking Machines and Milking Methods," and "Grazing Behaviour Studies as Pointers to Utilisation of Pastures by Dairy Cattle."

An open forum on modern methods of weed control will be led by specialist workers in this field from the Rukuhia Soil Research Station, Hamilton, the Department of Agriculture, and Massey Agricultural College.

THE HOME GARDEN IN MAY

By S. O. GILLARD, Vegetable Instructor, Department of Agriculture, Auckland.

KEEN home gardeners will be busy during May improving the appearance of the garden plot by clearing off the residue of such crops as pumpkins, kumaras, beans, marrow, tomatoes, and sweet corn harvesting of which has been completed. Discarded material should be burnt, but clean refuse should be put on the compost heap. Digging over vacant land and cleaning up and trimming path edgings, etc., impart a neat and tidy look to the garden. In most districts little sowing or planting can be done, and only the hardy vegetables such as brassicas, leeks, parsnips, turnips, carrots, lettuce, radish, and spinach will be growing.

[*Sparrow Industrial Pictures Ltd. photo.*

Calcium, the basic element of lime, is important. It corrects soil acidity, liberates certain plant foods, and improves the physical structure of the soil. Two forms of lime commonly used are carbonate of lime and burnt lime. Annual dressings of either should be made, carbonate at the rate of $\frac{1}{4}$lb. to the square yard and burnt lime at the rate of $\frac{1}{8}$lb. to the square yard. Lime can be applied at any time of the year and is best applied on the surface of the soil to be washed in by rains.

IN favoured localities where the soil is light and well drained and severe frosts are not experienced some planting and sowing may still be done, although it must be realised that little growth can be expected before August, except from well-established plants. Cold, wet soils are not suitable for winter cropping and even the hardiest plants or seeds set under these conditions will, if they survive at all, make little growth, and when spring growth begins are liable to run to seed or to be tough and tasteless.

Advantage can be taken of the winter months for trenching or digging the land and leaving it in a rough state so that a greater surface is exposed to wind, rain, and frost. The elements have a very beneficial effect on the soil, and, besides destroying harmful insects, make heavy soils more friable and easier to work in early spring.

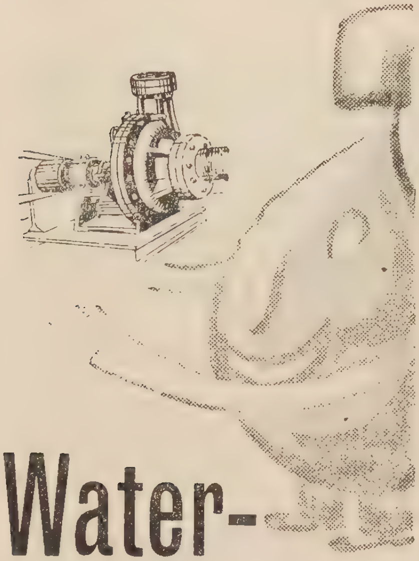
Under favourable conditions cabbage, cauliflower, lettuce, and endive can be planted out, and spinach, broad beans, radish, and a few early peas may be sown. If a sowing of onions has not already been made, the seed should be sown without further delay, for germination is likely to be seriously affected by cold, wet weather or the lifting of the soil caused by frosts. All potato, kumara, and any late-maturing pumpkin crops should be harvested without delay, as no further growth can be expected, and frost experienced when they are still in the field will seriously impair their keeping qualities. Growing crops should be cultivated frequently to promote growth; this work should be done only when the soil is sufficiently dry to facilitate cultivation. Compaction generally occurs if the soil is worked when in a wet, sticky condition, and this condition is further aggravated if the gardener is walking over the ground at the same time. The soil should be kept drawn up to cabbage, cauliflower, and brussels sprouts, and moulding up of mature leeks and celery should be completed, care being taken not to cover the heart leaves with soil. Rhubarb beds should be weeded and any seed stalks or old dead leaves removed. As soon as the fern growth of asparagus turns yellow it should be cut and burnt. Crops in storage should be examined and any showing signs of rot should be removed. Vacant ground can be sown with a quick-growing cover crop and newly dug ground can be limed.

[*Sparrow Industrial Pictures Ltd. photo.*

To produce long, succulent stalks of rhubarb heavy manurial dressings are necessary. About a handful of blood and bone to each plant applied now will carry roots through until it is time to apply heavier dressings in spring.

Cleaning Up the Garden

With a little attention the garden can be made to look attractive, although there may be little growing in



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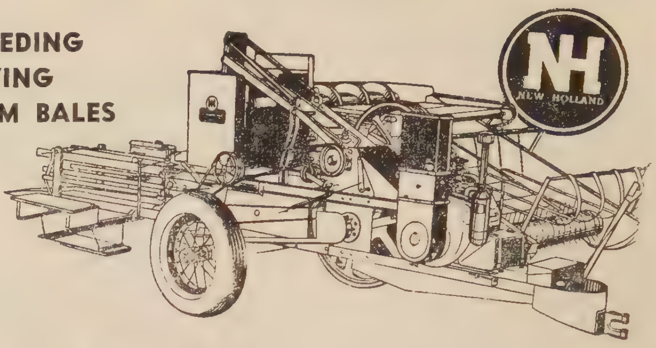

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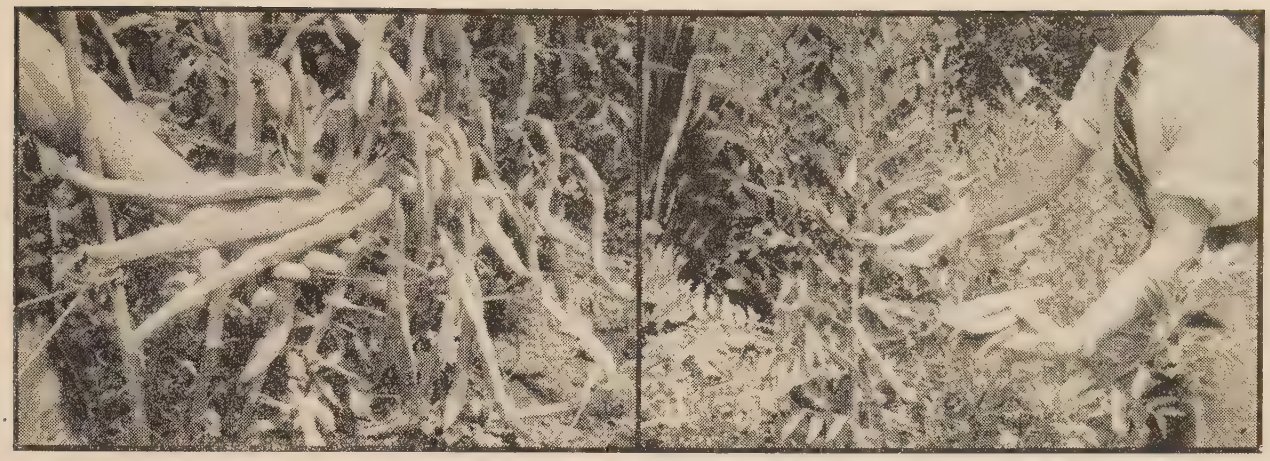


[*Sparrow Industrial Pictures Ltd. photos.*

Varieties of broad beans: Leviathan Long Pod (left) and Broad Windsor (right). Long-podded types are more prolific bearers; Broad Windsor types are claimed to be of superior flavour.

it. The first task should be the clearing of all spent crop refuse, utilising all material free of disease for the compost heap.

Compost heaps will need some protection against winter rains; water-saturated heaps in winter become cold and decomposition practically ceases. Sacking treated to make it water repellent and stretched over a framework over the heap will make a big difference to the rate at which the heap decomposes.

As soon as tomato stakes are no longer required they should be removed, tied in neat bundles, and stored. Rubbish such as pieces of wood, old partly rotted garden pegs, pieces of string or raffia, bark from stakes, old boxes, etc., should be gathered and burnt with any diseased crop refuse. Untidy corners where grass growth has been allowed to flourish should be cleaned out.

Rubbish left in heaps on or near the garden area provides breeding places for garden pests such as slugs, snails, earwigs, slaters, cutworms, millepedes, stem borer, and wire worms; while heavy grass growth or weeds in or adjoining the garden plot are a means by which pests such as thrips, mites, and aphides and also fungous diseases may be carried over from one season to another.

Asparagus

The tall fern growth of asparagus which develops after harvesting has ceased should by now have stopped growing. As soon as it begins to turn yellow it should be cut about 2in. from ground level, removed from the bed, burnt, and the ashes broadcast over the crowns, thus providing a supply of potash which is so desirable for asparagus. After the removal of the fern growth all large weeds should be pulled and the bed dressed to a depth of 1in. with a good rich compost mixture. If compost is not available, a good handful of blood and bone should be applied to each crown. A similar quantity of soot and wood ashes is beneficial. Finally a thin layer of clean soil should be spread over the whole bed. For a long and profitable life plenty of manure is necessary for asparagus.

Broad Beans

May is the recognised time for the first sowing of broad beans, which are quite hardy and do especially well in cool weather in most well-drained soils. However, although good drainage is essential, soils which tend to dry out are not suitable, as very dry conditions adversely affect the setting of crops. As broad beans need sweet, well-limed soils, it is usually necessary to apply carbonate of lime, at 2 to 4oz. to a square yard, preferably several weeks before sowing the seed.

[*Sparrow Industrial Pictures Ltd. photo.*

Mature leeks should be used during winter, as they lose their flavour quickly and run to seed in spring.

The ground should be deeply dug and worked down to a fair tilth and if it had been manured for the previous crop will require no additional fertiliser at planting time, except a dressing of 1oz. of sulphate of potash to the square yard. About a month after sowing, when the plants are about 12in. high, a side dressing of equal parts of superphosphate and blood and bone applied on each side of the plant rows at the rate of 1lb. to each 12ft. of row will benefit most soils. This can be worked into the soil when drawing it up to support the plants. Seed may be sown in double rows about 6in. apart, allowing 4ft. between each set of double rows, or in single rows 3ft. apart. Set the seed 2in. deep and 6in. apart in the rows. For the double rows place the seed diagonally and not opposite each other. Early sowings in heavy soils may be made on low ridges.

When the first flowers appear pinch the top off each stem to induce lateral growth and to encourage better setting of pods. The tips of broad bean plants may be cooked and eaten. Pods should be gathered as they mature, so that the strength of the plant is maintained and the bearing period prolonged. If seeds are allowed to mature, flowering ceases and the plants soon die off.

Varieties: The most suitable types for the home garden are Leviathan Long Pod, which produces pods up to 16in. in length with 10 to 12 seeds, and Broad Windsor, a short, broad-podded type containing about 5 large seeds to a pod. Although the Windsor varieties are claimed to be of superior flavour, the long-podded types are hardier, heavier yielders, and usually earlier.

Jerusalem Artichoke, Leeks, Peas

The tubers of the Jerusalem artichoke should be ready for harvesting now. Care should be taken to leave none of the knobby tubers in the ground, as they will start growing and become a nuisance among a following crop. Store the tubers in a dry place, if possible in dry sand or sawdust. If the tubers are left in the ground over

THE HOME GARDEN IN MAY

[*Sparrow Industrial Pictures Ltd. photo.*

Varieties of spinach: Prickly-seeded (left), which will grow well in cool weather, and round-seeded (right), which is best suited for summer growing.

winter, they lose their sweet flavour and some of their nutrient value. Tubers may be set in June for next season's crop.

The best variety is White Jerusalem, which has pure white tubers, almost round, with few and very shallow eyes.

Leeks withstand cold weather much better than most other vegetables and fair growth can still be expected where the soil is light and rich. Mature leeks should be used during winter, as they quickly lose their flavour and run to seed once spring comes. The soil should be earthed up around the stems to lengthen and whiten them.

In favourable localities where severe weather is not generally experienced in early spring a small sowing of an early variety of pea may be made. At this period of the year the seed is best sown on ridges, which provide better drainage and warmer soil conditions. Ridges are formed 2ft. 6in. apart. A hoe is used to draw a furrow 2in. deep along the top of the ridge. The seed is scattered about 1in. apart in the furrow.

Varieties: Good varieties to sow now are William Massey, Blue Bantam, Little Marvel, and Earlycrop.

Spinach and Salsify

The well-known high nutritive value of spinach justifies the planting of this vegetable in every home garden. It is not hard to grow provided it is given plenty of plant food and moisture. Spinach grows quickly, maturing under favourable conditions in about 40 to 45 days. It will grow through the winter in most localities.

Like all greens spinach is best when grown quickly and without a check. The soil should be well dug and worked down to a fine tilth and should be heavily manured with well-decomposed animal manure or compost. As an alternative a balanced fertiliser mixture such as blood and bone 15 parts, superphosphate 5 parts, and sulphate of potash 1 part (all by weight), worked into the top 6in. of soil at 1lb. to a square yard, is recommended.

Seed should be sown thinly ½in. deep in drills 12in. apart. The plants should be thinned out later if they crowd each other unduly; the thinnings can be cooked.

Varieties: For summer and autumn use the round-seeded spinach is best, and may be sown from September to the end of January. For winter growing prickly-seeded is best. To provide a succession sow every 4 weeks.

Salsify is known as vegetable oyster because, when cooked, its flavour is suggestive of oysters. It resembles a parsnip, although the roots are much smaller and the leaves are narrow, like those of a leek. It is not a commonly grown crop, but some prefer it to parsnip because it lacks the peculiar flavour of the latter vegetable. Salsify needs a long season of growth and is grown from seed sown in September and October, and although the roots may be used any time after they have grown large enough to be worth pulling, they are generally left until May, when they are fully mature.

Radish

Radish may be had almost the whole year round by making successional sowings every 4 weeks. They are very easy to grow, require little space, and are ready for use 3 to 6 weeks after sowing. Spring-grown radishes are the quickest maturing of garden crops. They do best in cool weather and are adversely affected by hot, dry conditions. To be tender and mild in flavour they must be grown quickly and have plenty of moisture. If checked in growth they will be hot, tough, and worthless.

Seed can be sown each month, selecting a well-drained situation in winter and a moist one in summer. The soil should be well worked to a depth of at least 9in., especially when the long varieties are to be grown, and it is best to work manures in several weeks before sowing the seed. The mixture recommended consists of equal parts of dried blood and superphosphate broadcast over the area at the rate of 8oz. a square yard and thoroughly worked into the soil.

During the cooler months, when growth is slower, the seed is best sown thinly ½in. deep in drills 6in. apart so that the plants can be cultivated. In summer, when radishes grow quickly, the seed may be sown broadcast very thinly. In hot weather or in fairly dry soil the seed may be sown deeper.

The best of the long varieties are Icicle, a white variety suited for growing all the year round, and Long Scarlet, a very attractive radish with a scarlet skin and white flesh.

Of the turnip or round and oval varieties the best are Red Turnip, White Turnip, and French Breakfast.

Shallots

The shallot is closely allied to the onion, but its habit of growth is different. Shallots grow in clusters

[*Green and Hahn Ltd. photo.*

Salsify or vegetable oyster is usually fully mature by May. It is used similarly to parsnips and is generally left in the ground and harvested as required during winter.

which remain attached to the parent root throughout the growing period. The larger types may be used instead of onions. They are prolific, easy to grow, and may be set out at a period when the land would be in an unsuitable condition for the sowing or transplanting of onions.

Shallots can be planted in May or June and if larger bulbs are selected they will be ready to harvest in December or January. Shallots grow best in light, well-drained, rich, loamy soil that has been heavily manured for a previous crop. If the soil is in a poor condition, a mixture of equal parts of blood and bone and superphosphate plus 5 per cent. by weight of sulphate of potash should be thoroughly worked in at the rate of 8oz. a square yard.

For planting, the clusters are divided; the larger bulbs produce more plants per bulb and the plants are taller with more leaves. Drills are drawn 1in. deep and 12in. apart. The bulbs are pressed into the bottoms of the drills 6in. apart and are then covered lightly with soil. During the growth of the crop the ground should be kept well cultivated and free from weeds.

PESTS AND DISEASES IN HOME GARDEN

[*Green and Hahn Ltd. photo.*

Spring varieties of cabbage planted in May will be ready to harvest in early spring.

Cabbage and Cauliflower

In districts that are favoured with mild winter weather cabbage may still be planted. Plants set out now should be of good size and stocky, but cannot be expected to grow as rapidly as earlier-established ones. The site chosen should be well drained and the soil rich in organic material and previously well limed. For winter growing the plants should be set on ridges. A fertiliser mixture consisting of blood and bone 15 parts, superphosphate 5 parts, and sulphate of potash 1 part (all by weight) is recommended. The fertiliser should be spread on top of the ground along the row and the ridge formed by drawing the soil over it. Ridges should be 24in. apart. Slightly flatten the top of the ridge with a rake and set the plants along the centre, spacing them 15in. apart.

Recommended varieties are Succession, Enfield Market, Flower of Spring, and Early Jersey Wakefield.

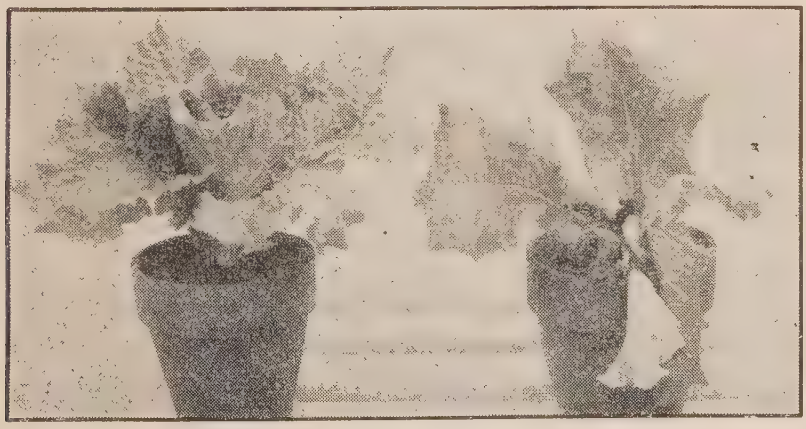
In warm climates cauliflowers may be planted out now for harvesting in October and November. They can be grown on ridges 2ft. 6in. apart with the plants 18in. apart. They need more manure than do cabbages—about 2oz. of the cabbage mixture to each foot of row. To produce a good curd the plants should be side dressed when about half grown with a mixture of equal parts of sulphate of ammonia and superphosphate at the rate of 1oz. to each plant.

Good varieties for planting now are Phenomenal (five months), Late Metropole, and Walcheren.

Lettuce

During the winter the growth of lettuce will be slow and to keep the plants growing steadily the soil should be cultivated frequently. An application of nitrate of soda, 1oz. per square yard spread between the plants at fortnightly intervals, will also help, but care should be taken not to allow the fertiliser to contact the stems or foliage.

Lettuce plants set out this month should be planted in raised beds into which has been worked a fertiliser mixture composed of dried blood 4oz., superphosphate 5oz., sulphate of ammonia 1¼oz., and sulphate of potash ½oz. a square yard. Set the plants 8in. apart in rows 12in. apart.



Spotted wilt on lettuce; infected plant on right, healthy plant on left.

Varieties: A variety which is suitable for a wide range of conditions is Neapolitan, also called Webbs Wonderful and New York; there are two strains, winter and summer. Imperial No. 615 is also ideal for growing in cool weather. Champion Cos, an upright growing variety, is especially suitable for cold districts.

Celery

Celery plants should be sprayed every 10 to 14 days with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water) or with copper oxychloride (3oz. to 4 gallons of water) to prevent their being spoiled by leaf and stem spots.

Trenched celery does not require to be blanched artificially, but plants grown in surface rows may be blanched by drawing the soil up round the stalks. To prevent soil entering the heart of the plant when this operation is being performed the outside stalks may be tied loosely together near the top of the plant. Celery can also be blanched by fastening paper collars (preferably waterproof paper) round them. When placing the collars keep the bottom edge about 1in. off the ground to allow a circulation of air. Blanching may be done by placing 10 to 12in. wide boards on edge along each side of the rows and holding them there by stakes driven in at intervals.

Control of Pests and Diseases

A section on control of pests and diseases in the home garden has appeared in successive issues since December, 1949, and other troubles and the methods of combating them are dealt with in the following section of this month's notes.

Lettuce

Grey mould (*Botrytis cinerea*) is a fungous disease which may be very destructive to lettuce. During spells of moist weather or under winter conditions when the lettuce plant is not making rapid growth infection may readily occur on leaves which have been injured, especially in badly drained situations. Infection spreads

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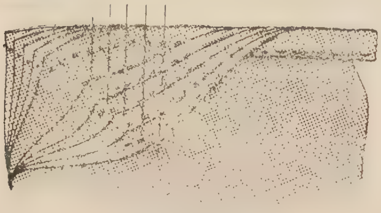

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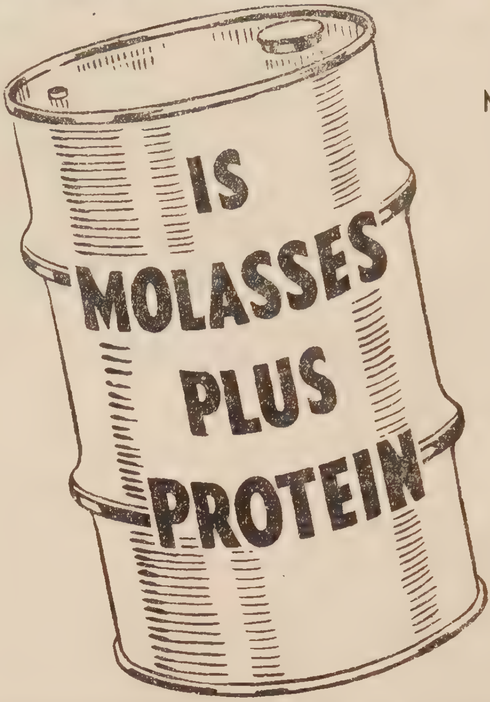

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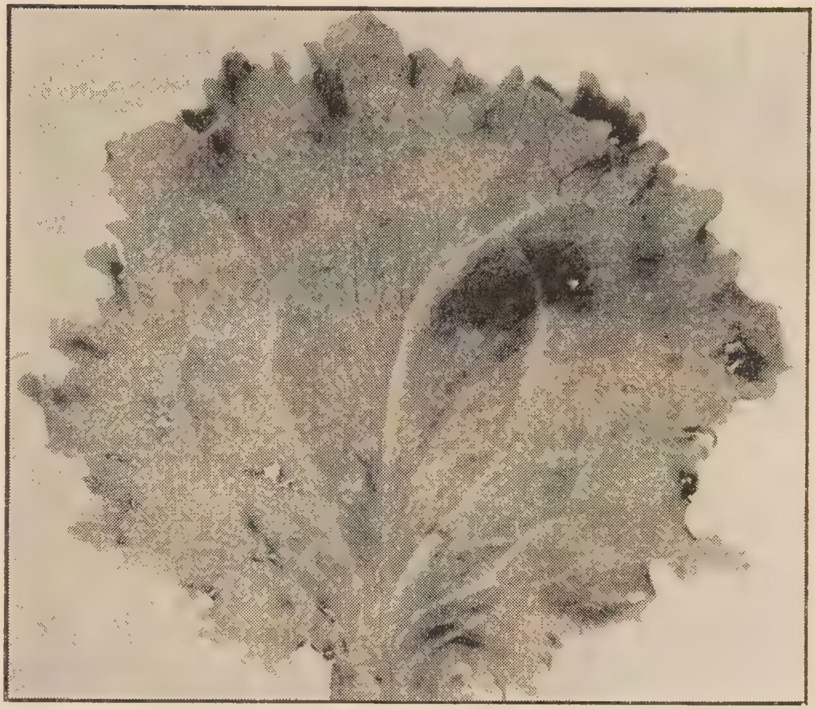
to the stem and brings about a reddish discoloration. Subsequently the stem may rot entirely and break off near the surface of the ground. The ashen-grey fructifications of the fungus are produced in abundance on the decaying leaves and the disease is spread rapidly from plant to plant. Small black resting bodies are formed which may remain in the soil for some time and lead to infection of later lettuce crops.

Treatment: The disease is difficult to control. Rogue out affected plants and spray those remaining with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water).

Drop or sclerotinia disease (*Sclerotinia sclerotiorum*) is a fungous disease which is more prevalent in summer. Young lettuce which become infected with the disease wilt and rapidly die. The fungus attacks the plants at ground level, causing the leaves to collapse suddenly. Infected plants ultimately become soft and watery and are permeated by the copious white fluffy mycelium of the fungus, which later develops large black sclerotia or resting bodies. These can live in the soil until the following season and then produce very small, flat, toadstool-like bodies which release spores that may affect other plants.

Treatment: Prompt removal of affected lettuces with a little of the surrounding soil will prevent sclerotia from being formed in the soil and infecting later crops. All debris should be burnt and not placed on the compost heap.

Ring spot (*Marssonina panathoniana*), sometimes called "rust," is a fungous disease which is troublesome mainly in autumn, winter, and spring. It produces circular brown spots about ⅛in. in diameter on the leaves and sunken brown markings like slug damage on the undersides of the midribs. Early infection of the plant may result in its becoming stunted and late infection may cause disfigurement of the lettuce, necessitating the removal of an excessive number of wrapper leaves.



Ring spot on lettuce leaf. [*W. E. Barnard photo.*

Treatment: Crop rotation should be practised. As infection may be carried over in the soil, it is important to burn all infected plants and debris. Where the disease is prevalent spraying at 10- to 14-day intervals with Bordeaux mixture or with copper oxychloride as for grey mould will give a satisfactory control.

Lettuce mosaic is a virus disease of lettuce which is not very important in the home garden unless the infection is severe, when it causes stunting of the plants, which often fail to heart satisfactorily and may only form rosettes. Although mosaic appears in many forms, it can generally be identified by a mottling of the leaves to form a mosaic pattern of light- and dark-green areas, often accompanied by crinkling and slight distortion of the leaves.

Treatment: Discard any seedling plants showing peculiar leaf mottling. Rogue out any larger plants which are showing symptoms and are stunted. Keep weed growth down, especially groundsel, which is a host for the virus, to avoid possible transmission by insects.

Spotted wilt: This is a virus disease of lettuce appearing as a marginal scorching or browning of the heart leaves. It results in a stunting of the plant and occurs mainly on one side of the lettuce, giving it a lop-sided appearance.

Treatment: Immediately the disease is recognised affected plants should be destroyed.

Downy mildew (*Bremia iactucae*) is a fungous disease mainly troublesome in the seedling beds, but it may also attack older plants in the garden. It causes pale spots and later a white downy growth on the underside of the leaves. The disease may be serious in badly ventilated or badly drained areas.

Treatment: Plants should not be grown too thickly in seedling beds and excess wetting of the foliage should be avoided. Where the disease is very prevalent spraying as for ring spot is recommended.

Late blight lesions on potato leaves.

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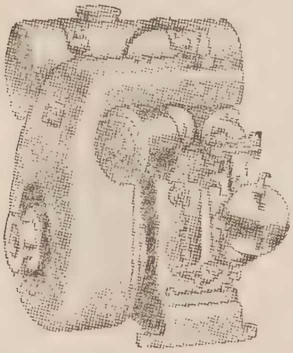

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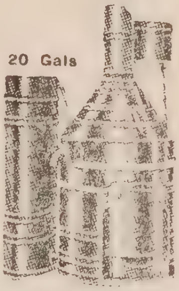

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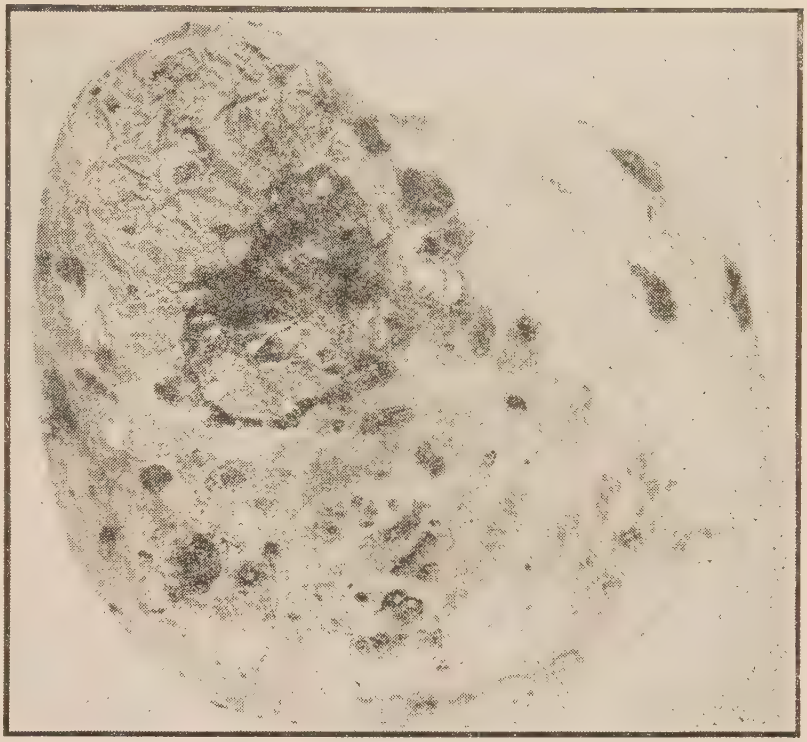
Insect pests: Lettuce is subject to attack by several kinds of insects, the principal ones being slugs, snails, cabbage looper caterpillar, and aphides. Of these, the first two named cause most concern to the home gardener, but they can be controlled by dusting the plants with burnt or hydrated lime. This should be done in the evening and when the foliage is dry. A bait containing meta solid fuel (one tablet powdered up fine and mixed with one cupful of bran or oatmeal and spread over the area where the lettuce is growing) is also effective. Looper caterpillar and aphides can be controlled by spraying with nicotine sulphate (1 fl. oz. to 4 gallons of water to which 2oz. of soft soap has been added).

Onion, Leek, Shallot, Chive, Garlic

Downy mildew (*Peronospora destructor*) is a common fungous disease of onions and allied crops, and may be very severe in some localities in wet seasons. Although mildew can appear on young plants, infection is not usually very obvious until the bulbs are beginning to form. It appears as light-coloured spots on the leaves. The spots may be indistinct at first, but the affected tissue is slightly depressed. As the disease progresses affected leaves become weakened, fall over, and shrivel, giving them a thin and grey appearance. If the disease is not controlled, the plants become weakened and the onions fail to size up well. Warm days and cool nights (if moisture is present) seem to provide conditions favourable for the trouble.

Treatment: The plants should be sprayed with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime in 4 gallons of water) or with copper oxychloride (3oz. to 4 gallons of water), plus a wetting agent, as the onion foliage is very hard to wet. Applications should be at 14- to 18-day intervals from October to harvesting time.



Potato injured by potato tuber moth.

Potatoes

Late blight (*Phytophthora infestans*), which also attacks tomatoes, is one of the worst fungous diseases, especially in wet seasons, with which the potato grower has to contend. It first appears as brown spots or blotches, especially on the margins or tips of leaves. These brown spots are often unnoticed until the dead areas curl up, but if they are left unchecked they may quickly spread to healthy leaves and finally result in the complete loss of the crop.

Treatment: To prevent this fungus from attacking the plants they should be sprayed at 10- to 14-day intervals from the time they are well above ground with Bordeaux mixture or with copper oxychloride at the strength mentioned for downy mildew of onions.

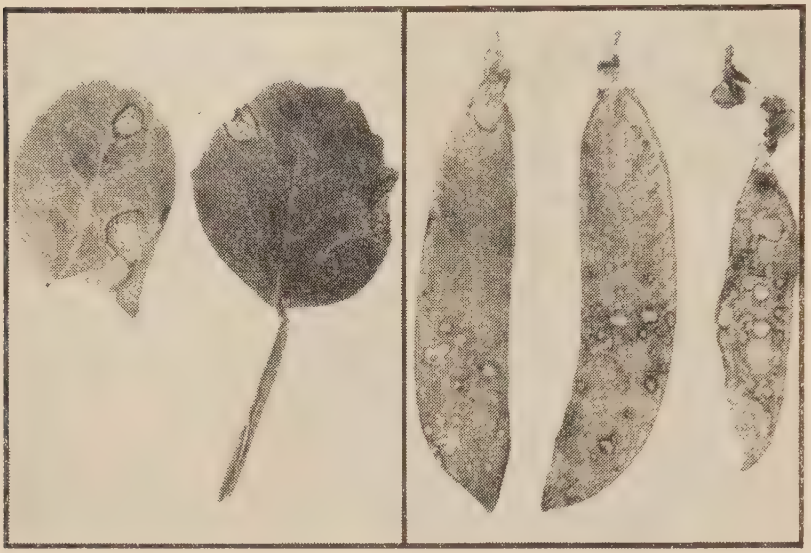
Virus diseases: The importance of virus diseases of potatoes is not realised by many home gardeners. Many plants suffer from these diseases to some extent, but potatoes in particular can be affected with several viruses which seriously retard cropping. All serious virus infections retard the growth of the plants and most of them are spread by insects. Where infection is found it is unwise to save seed from the crop, for the tubers from a virus-infected plant will produce infected plants the following season.

Treatment: As sprays or other practical methods of control are not effective in curing virus diseases, it is best to plant Certified seed saved from a healthy crop which was periodically inspected and certified as disease free.

Potato tuber moth (*Gnorimoschema operculella* Zell.): The adult tuber moth is a night flyer and lays its eggs on the leaves of the plants; the larvae burrow down the stems and may even reach the tubers below ground. When tubers are not properly covered with soil the moth will also lay eggs in the eyes; this danger applies also to potatoes in storage. The moth larvae cause dirty-coloured burrowings throughout the tuber.

Crinkle virus of potato; diseased and healthy Northern Star plants.

PESTS AND DISEASES IN THE HOME GARDEN



Ascochyta pisi lesions on pea leaves (left) and pods (right).

Treatment: During the growing season keep the potato plants well earthed up to protect the tubers from the moths. Do not leave dug tubers lying out at night where the tuber moths can lay eggs on them. When storing potatoes dust them with slaked lime as a protection against the moth. Another method which gives good results is to throw 1oz. of 2 per cent. D.D.T. dust in the bottom of the tin when the crop is being gathered. When the tin is filled with potatoes the contents are emptied into the bag and the dust swirls among the tubers, leaving a fine film on the surface of each. After the bag has been filled a few more ounces of dust should be sprinkled on the top to work its way down among the contents. It must be emphasised that with this method each tinful of tubers must have its quota of dust. Where potatoes have been treated in this way they should be washed carefully if they are to be baked in their "jackets."

Peas

Pre-emergence rots often cause a poor "strike" of pea seeds sown early in the season when soil conditions are wet and cool. Sometimes poor seed is blamed when failures have been caused by soil organisms attacking the seeds. After August the trouble is not likely to occur.

If the soil is wet and cold, seeds germinate slowly, and chances of injury by rotting fungi and bacteria are increased. Proper care of seeds before planting is an important precaution; they should be kept in a dry place and never be allowed to become damp. The soaking of pea seeds before planting should be practised only in dry weather and when the growing conditions are good. With good drainage and soil aeration seeds do not lie in cold, wet soil if wet weather follows planting.

The following seed treatment is recommended for very early sowings. Place ¼oz. of copper carbonate, copper oxide (red or yellow), or copper oxychloride in a lidded container with pea seed. Shake the container for several minutes, remove the seed, and screen out the excess dust. This amount (¼oz.) is sufficient to treat about 5lb. of seed. Treated seed may be stored for some time, but should not be planted in dry soil of low organic content or in very acid soils, as growth after germination may be retarded to some extent.

Foot and root rots may be caused by any one of a number of fungi and are most common where peas have been grown for a number of years in the same soil or where there has been a sudden change in the soil temperature, for example, when heavy rain follows a dry spell. The bases of the roots turn brown or purplish and later extensive blackening of the roots occurs. These root rots have been found associated with germinating seeds and are possibly encouraged by unfavourable soil conditions.

Treatment: Proper cultivation of land and rotation of crops and good drainage are necessary. Dust seed as for pre-emergence rots.

Powdery mildew (*Erysiphe polygoni*), a common disease of peas, appears as a white powdery coating on leaves and other green parts, causing yellowing of the foliage and possibly the death of the plant. This disease is more prevalent in dry weather. In very dry weather watering and mulching of the soil help to maintain vigour in the plants and to enable them to withstand the effects of mildew.

Treatment: Old pea vines should be cleaned up as soon as the crop is finished, as they may become covered with mildew and affect the later-planted ones. Do not allow the soil to become so dry that growth is retarded. In severe cases dusting the plants with finely ground sulphur is recommended.

Downy mildew (*Peronospora viciae*) brings about a greyish-brown growth on the under surfaces of the leaves and on the pods. Diseased pea pods often have no seeds but contain masses of spores. Young plants are sometimes attacked and seriously checked. The fungus is generally most troublesome during spells of moist weather.

Treatment: As the resting spores of the fungus may remain in the soil from one planting season to another, haulms should be burnt where the disease has occurred. Spraying the plants as soon as the fungus is seen with Bordeaux mixture or copper oxychloride (see recommendation for downy mildew of onion) will control the disease.

Leaf and pod spot of peas in New Zealand are mainly caused by three fungi, *Ascochyta pisi*, *Mycosphaerella pinodes*, and *Septoria pisi*. The spots caused by *Ascochyta pisi* are pale brown, surrounded by circular darker margins, ¼in. or less in diameter and somewhat sunken. *Mycosphaerella pinodes* produces smaller purplish-brown spots, often with concentric rings, on the leaves, and small irregular purplish spots on the pods. *Septoria pisi* causes light-brown, broad irregular lesions limited by veins on leaves and stems; small black pin-point spots are scattered over the lesions. Older leaves may become entirely covered with lesions and dry up.

The damage to foliage and pods by these fungi may be severe in very wet seasons. Infection of the pods almost invariably leads to infection of the seeds, which become mottled, with sunken brown or purple spots. Infected seeds produce diseased seedlings and damage to pea sowings may result in this way.

Treatment: Where a crop has been seriously affected with leaf and pod spot it is advisable to burn the haulm and not to use the ground again for peas for several years. Seed dusting to kill any surface-borne spores may also help to control this trouble. (See pre-emergence rots.)

Pea mosaic is a virus disease fairly serious on pea crops in some parts of New Zealand. Affected vines produce distorted and poorly filled pods. As with most virus diseases, the symptoms usually manifest are crinkling, mottling, and distortion of the leaves. There are several kinds of virus which cause different symptoms. In some cases a leaf vein clearing is characteristic; in others the leaves are spotted, mottled, and severely twisted and curled, and the plant is so stunted that it produces very few, if any, usable pods. If any seeds are developed, they are likely to be smaller and more yellow than normal peas.

Treatment: Several varieties are resistant to pea mosaic and where this disease is troublesome these should be given preference. Resistant varieties include Daisy, English Wonder, Little Marvel, William Massey, Onward, and Lord Chancellor.

Acknowledgment

Acknowledgment is made to the Plant Diseases Division of the Department of Scientific and Industrial Research for assistance in the preparation of the section dealing with diseases and their control and for supplying the photographs included in this section.

CARE OF LIVESTOCK DURING MAY

Contributed by the Animal Research Division.

MILKING-MACHINE OVERHAUL

AS soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production and will help to reduce mastitis. The Department of Agriculture's Bulletin No. 260, "Mechanical Milking," should be carefully studied by every dairy farmer.

* * *

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

* * *

UNTHRIFTY CALVES

At the first sign of unthriftiness calves should be drenched with phenothiazine, the full dose recommended on the label being given. Drenching, however, will not be effective unless the calves are properly fed. The best feed for calves is good, fresh pasture and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement sappy young autumn pasture.

* * *

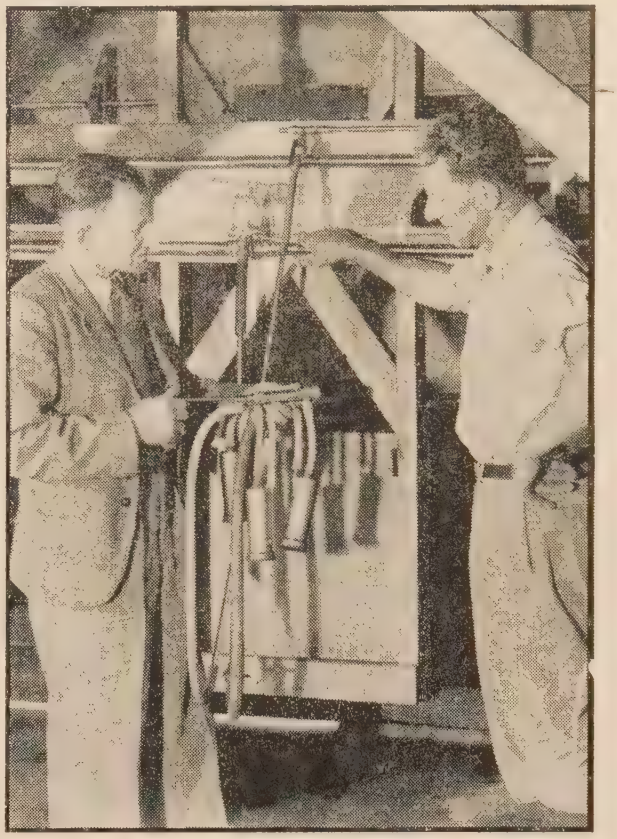
AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Autumn-saved pasture is invaluable for early - calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, feed silage to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until 3 or 4 weeks before lambing. This also will enable some paddocks to be spelled. Further particulars of autumn-saved pasture will be found in an article on page 177 in the February, 1949, issue of the "Journal."

* * *

PURCHASE OF HERD SIRE

If a new herd sire will be required this year, now is the time to make inquiries. The New Zealand Dairy Board issues a Sire Survey and Merit Register which gives the production of the daughters of all dairy sires which have been surveyed. Unfortunately very few progeny-tested sires are available, but the register should be consulted and wherever possible a son of a proven sire should be selected. Bull catalogues are issued annually by the Herd Improvement Association and these, too, should prove of considerable value to dairy farmers who are looking for herd sires.



* * *

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs, in a very high percentage of cases, can be prevented by vaccination. This is best done when the pups are 3 to 4 months old. The virus, which has a short life, is imported from Australia and it is therefore necessary to notify the local Veterinarian at least a month before it is wished to vaccinate the pups.

* * *

BLOOD POISONING IN HOGGETS

Blood poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine which confers very good immunity is now available for purchase in New Zealand. On properties where losses have been experienced previously, hoggets should be vaccinated a fortnight before they are placed on turnips. The nearest Veterinarian or Inspector of Stock should be consulted concerning the method of vaccination.

Danger to Horticultural Crops from Indiscriminate Use of Hormone Weedkillers

By G. A. H. HELSON, Horticulturist,
Department of Agriculture, Wellington.

WITHIN the past 20 years a new group of substances that have brought about a new concept of weed control have been added to the list of materials used in agriculture. These are known as growth-regulating substances, because, when used in the correct amounts, they will inhibit, increase, or alter in various other ways the subsequent growth of treated plants. Some are used to promote growth when used in very dilute solutions, and as weedkillers and herbicides when used in greater concentrations; some are used to prevent fruit from dropping and others to produce seedless fruits. There can be no doubt that the discovery and synthesis of growth-regulating substances or hormones is a marked step forward in agricultural progress and that these substances will have an ever-increasing application to food production.

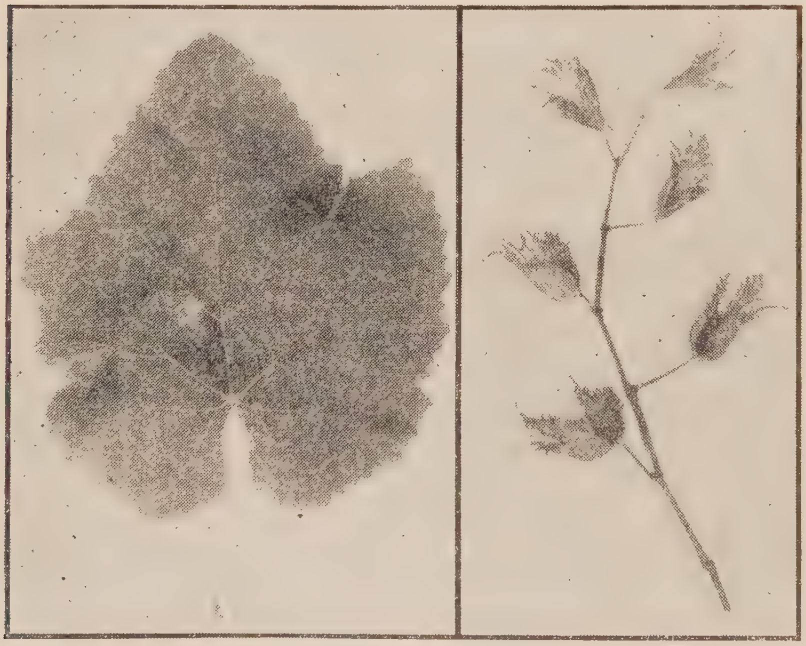
GROWTH-regulating substances are specific in that they each produce certain well-defined reactions on plants. Advantage has been taken of this property in developing selective hormone-type weedkillers, the use of which has become spectacular in the last 2 or 3 years, and which have received publicity without, in many cases, due warning being given of the danger to many crops following their indiscriminate or careless use. These substances damage or kill certain plants while doing relatively little harm to others such as members of the grass family. Their effect when applied in sufficient quantity is to stimulate susceptible plants so that the excessive or abnormal growth which results frequently kills the plants.

This effect on susceptible plants makes the use of these types of weedkillers dangerous to some crops, and during the past year the Horticulture Division of the Department of Agriculture has received many reports of damage from various parts of New Zealand. Plants affected by direct application of spray, by spray drift or by harmful vapours arising from recently treated areas—over distances as far as half a mile—and by the use of spraying equipment previously used for the application of a hormone-type weedkiller include grapes, tomatoes, kumaras, apple, pear, lemon, fig, pumpkin, barberry, flowers, and shrubs. Grapes and tomatoes, both outdoor and under glass, are particularly susceptible and great care should be exercised in the use of hormone weedkillers anywhere in the vicinity of these crops.

Sprayers or other equipment used for the application of hormone weedkillers must be thoroughly cleansed. One cold-water rinse is not sufficient. Several changes of warm water to which a little baking soda or washing soda has been added should be used, or the equipment should be cleansed as recommended by the manufacturers of the various preparations. The only really safe method is to have separate spraying equipment used only for the application of the weedkillers. When spraying a lawn or other area never allow the spray to reach nearby ornamental or crop plants. Even small amounts of drift may injure these plants, some of which are highly sensitive. Application should be made only on a very calm day to prevent drift and with a nozzle delivering a coarse spray in those cases where there is danger to nearby susceptible crops. The use of newly developed, non-volatile hormone-type weedkillers will do much to prevent damage to such crops.

Temporary soil sterilisation may also result from heavy applications to the soil. How long these effects will remain depends upon the amount of chemical used, temperature, rainfall or irrigation, soil type, and crops planted. While cereals and grasses are usually not affected if planted within a few weeks after treatment, beans, peas, lettuce, tomatoes, cabbage, broccoli, sugar beets, lucerne, and many other crops are extremely sensitive to small quantities of hormone-type weedkiller and crop failures may occur in these circumstances.

There is no danger in using hormone weedkillers on pastures or in other areas where stock have access, as they are non-poisonous to animals. When application is made to pastures, however, great care should be exercised to prevent spray drifting on to other susceptible crops. When poisonous plants are being sprayed stock, nevertheless, should be excluded from the area, as there is a considerable danger of such plants being made palatable by the application of hormone weedkillers. If there is any doubt about the safety of using hormone weedkillers, an instructor of the Department of Agriculture should be consulted before application is made.



[Eric R. Booth photos.

Left—Normal grape leaf. Right—Grape leaves showing injury by 2, 4-D.

CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture," subscribers are required to give 4 weeks' notice of change of address. The old address and the new address, together with an address label clipped from a recent "Journal" envelope or wrapper, should be sent to the nearest office of the Department of Agriculture.

Saving Autumn Grass for Winter and Spring Feed

SEASONAL NOTES Contributed by the EXTENSION DIVISION

PREPARATIONS should be made now to provide grass for milking cows next July and August by saving the autumn and early-winter growth of grass. Fields reserved for this purpose should be dominantly ryegrass; short-rotation ryegrass is a stronger winter grower than perennial ryegrass, and on suitable land mixtures of 50:50 short-rotation and perennial ryegrass are excellent for this purpose. Feed cannot be saved after all the fields on the farm have been grazed bare in early winter; closing must take place while the grass is still growing and this necessitates early-autumn supplementary feeding.

* * *

WHEN TO CLOSE FIELDS

In most North Island dairying districts grass growth continues until mid- or late June. The closing of fields should start in late April and continue to mid-June. The early-closed fields will generally give two grazings and the later-closed fields one grazing of saved grass from late winter to early spring.

* * *

TOPDRESSING

All fields for saved grass should be topdressed in early autumn with superphosphate (and lime or potash if necessary). The application of nitrogen in the form of 1cwt. of sulphate of ammonia may be advisable to stimulate growth in the later-closed fields and should be applied before rain; application during dry, frosty weather should be avoided. Fields which are fairly regularly closed for winter feeding should be heavily topdressed with phosphate and kept fairly close grazed in late spring and early summer to avoid white clover suppression. It is sound practice to topdress such fields twice a year, applying 2cwt. of superphosphate in November and a further 2cwt. in March.

* * *

WHEN TO FEED OFF

Undue rankness in saved pastures should be avoided as a heavy grass growth suppresses white clover, and the lower grass is apt to decay. The grass should be fed off when it reaches a height of 8 to 9in., but the early fields should be grazed lightly so that they will recover quickly and give a second feeding off. Fields closed in April-May will generally be ready for their first feeding in late June-early July and will give a second grazing in late August-early September. Fields closed in May-June will provide feed in July-early August. On average dairying land about a quarter of the farm should be closed to save grass for rationed feeding during late winter and early spring; the area should comprise at least four fields to allow rationed utilisation from late June to the end of September.

* * *

POTATO DIGGING

Of all crops there is perhaps no other that responds as well as the potato crop to careful handling not only when it is growing, but more particularly in harvesting, storage, and grading. The potato is a perishable commodity and rough and careless handling can result in a high percentage of waste.

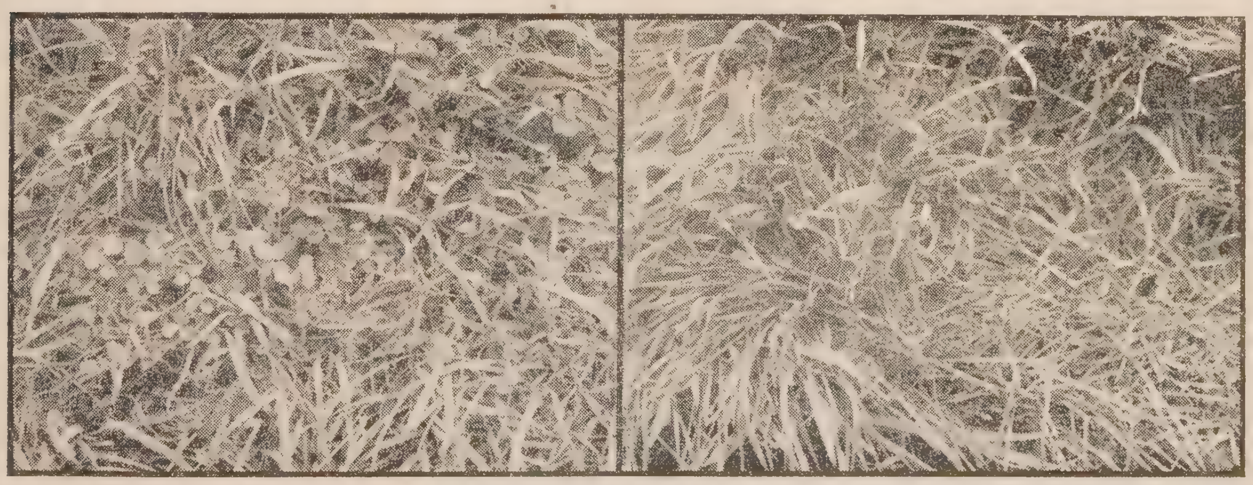
Damage which leads to dry rot is probably the biggest trouble the farmer has to contend with and the most difficult to detect when grading. Care at digging would avoid much tuber damage and prevent infection by dry rot. If soil conditions are dry and little soil is passing over the digger, the back apron should be removed and plain rollers used on the front chain. At all times the digger should travel at a low speed, as the less agitation the potatoes receive on the digger aprons the better. It is only from bruises and damage caused at digging that dry rot can set in.

* * *

GRADING SEED POTATOES

The grading of seed potatoes is essential if the buyer is to receive a product that is reasonably free from damage, dry rot, and tuber-borne diseases and is of uniform size.

Care must be exercised when grading, as no variety will stand rough handling. Mechanical graders should be fitted with rubber-covered riddles and these should have sufficient pitch to make the tubers roll smoothly when in motion. The riddles should be kept full so that the potatoes do not bounce and become damaged. Graders



Winter spelling tends to reduce white clover in a pasture. Pastures should not be allowed to become rank; they should be fed off lightly when growth is 8 to 9in. high and closed again for a further feeding, adequate lime and phosphatic topdressing being maintained. The turf on the left shows the clover recovery in a field saved for feed in the previous winter; that on the right shows saved pasture in early July from early June closing.

SAVING AUTUMN GRASS

should be geared to work slowly, minimising agitation which damages the tubers. Speed defeats its own end.

In grading seed potatoes for certification it is essential that all damaged, misshapen, and scabby potatoes are picked off. An odd damaged or scabby tuber allowed to remain may cause the whole line to be rejected.

* * *

CARE OF HARVESTING MACHINERY

Completion of harvesting calls for early attention to the repair, maintenance, and housing of all harvesting machinery and equipment. Every item should be thoroughly cleaned and carefully inspected and checked for worn, broken, and loose parts. Minor repairs should be effected now, and though major ones may have to wait until the slacker winter months, they should be noted at this early inspection and any necessary replacement parts and spares ordered immediately. When restored to good working order machines and gear, where necessary, should be given a protective coat of paint, oil, or grease. After the harvest is over all items should be housed and machine parts covered to give protection from dust. Timely attention to these details ensures efficiency and safety in future operations, and prolongs the effective working life and maintains the value of costly machines and equipment. Neglect is delaying, wasteful, and dangerous.

GOVERNMENT STOCK SEED

Seed growers are reminded that the Department of Agriculture is now accepting applications for Certified Government Stock grass, clover, and lucerne seeds. Applications from farmers for these seeds must be made through mercantile firms and must include the name and address of the farmer, the quantity of seed required, the acreage of individual paddock or paddocks for which seed is required, and, if possible, the registered number and letter of the area concerned. Where more than one class of seed is requested the application must state clearly whether the seed is required for separate areas, whether the requirement is in the nature of an alternative application for the same area, or whether different kinds of seed are to be sown together in the one area.

All applications received by May 31 will receive consideration when allocating seed available for distribution in 1950.

In making allocations preference will be given to those applicants who, in the opinion of the Department, will make the best utilisation of the seed available.

* * *

COCKSFOOT SEED

Certified Government Stock cocksfoot seed is produced and distributed by Canterbury Agricultural College, Lincoln, to whom intending purchasers are referred for particulars of supply.

Litter Performance of Large White Sow

THE number of pigs reared within a specified time very largely determines the profit which can be obtained from a sow. When prolificacy is coupled with good mothering temperament and milking ability and the management is such as to allow full expression of these qualities the sow is indeed able to prove that she is one of the most profitable animals on the farm.

The following record of the breeding performance to date of Tir-owen Sally (6630), a Large White sow bred by Mr. W. Hamilton, Totara, Oamaru, farrowed on August 18, 1945, and owned by Mr. L. Adam, Otokia, Otago, is a model of consistent production. Regular breeding, in this case, is combined with good mothering and milking capacity, resulting in an average weaning weight of over 418lb. at 8 weeks.

Farrowing date	No. born	No. reared	Litter weight 3 wks.	Litter weight 8 wks.
			lb.	lb.
4/8/46	15	12	146	420
25/1/47	15	11	134	367
1/8/47	19	11	111	301
1/2/48	19	10	140	380
14/8/48	19	17	165	652
3/2/49	19	11	133	404
11/9/49	18	9	102	403
Totals	124	81	931	2927
Average:				
7 litters	17.7	11.6	133	418
Per piglet			11.5	36.1

—*A. LONGWILL, Superintendent of the Pig Industry, Department of Agriculture, Wellington.*

Tir-owen Sally with some of the pigs of her seventh litter, farrowed in September, 1949.

BOOK REVIEW

"Plant and Soil Water Relationships":

P. J. Kramer

THIS book, published in 1949, is another very useful compilation of recent advances of research work; in this case of part of the field common to plant physiology and soil physics. The scientific papers of about 420 authors have been used as basic material and the resulting volume is an authoritative summary of their work. Although such a summary leads at times to a rather disjointed construction, it is work of this nature which makes it possible to keep abreast of recent scientific work and to cover the field of scientific endeavour in a manner quite impossible without such aids.

As the author says in his preface "This book is intended for teachers, investigators and students in both the basic and the applied plant sciences. It should be especially useful to botanists, agronomists, foresters, horticulturalists and soil scientists who are interested in plant-water relations." It is not a book for the general reader.

On studying the book the reader is left with an impression of incompleteness in many of the fields covered and is at times liable to be confused with apparently contradictory reports from different workers. This is reflected in the author's summing up of various sections. Nevertheless this is a healthy sign and it is noteworthy that many of the earlier investigators were inclined to be dogmatic in their views, which were based on much more shaky evidence than is available today.

—*P.B.L.*

McGraw-Hill Book Co., Inc., New York.

Results of First Laying Trial for Breeding Pullets

THE first breeders' laying trial ended at the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, on February 26, having begun on March 28, 1949. In this article F. C. Bobby, Superintendent, Poultry Industry, and D. F. Smith, Poultry Research Officer, both of the Department of Agriculture, Wellington, analyse and comment on the results of the trial, which was of a type new to the poultry industry of New Zealand.

An outstanding White Leghorn breeding hen which should be taken as a standard by all Leghorn breeders.

THE primary object of this trial is to offer to poultry producers facilities for testing future breeding stock—facilities which often are not available on their own farms. The conditions under which this trial is administered vary considerably from those governing laying contests or trials held previously in New Zealand. It is in no way a contest; rather is it a means of measuring the productive powers, the livability, and the quality of pullets intended as breeding stock.

The trial has an added advantage. Each entry is of 20 pullets, which constitutes a sample of sufficient size with which to measure the value of any particular strain of birds or, indeed, of a flock. The value of this aspect of the trial is greatly increased if the breeder sends an average or random sample of pullets. For the enthusiastic breeder who lacks facilities for trap nesting or single penning the trial offers facilities for testing full sisters, half-sisters, or a random sample of some new strain under observation.

Another aspect of this new type of laying trial is worth careful consideration: From an entry of 20 good pullets there is an excellent chance that, say, 12 may prove fit to breed from in their second year. They form a ready-made breeding pen, awaiting only the addition of a good male bird. Guesswork in selection is eliminated and each bird can be assessed on definite information.

The future of this type of trial rests in the hands of poultry producers throughout New Zealand. Given strong support, the present trial can be expanded and developed to offer the maximum assistance to breeders. Detailed work of this nature costs money, and it was decided to start with an entrance fee of £5 per entry. This figure will be reviewed from time to time and will be kept as low as possible consistent with giving accurate information.

Entries for 1949-50 Trial

Entries for the first trial totalled 15 pens containing 300 pullets—8 pens of White Leghorns, 6 of Black Orpingtons and Australorps, and 1 of Barred Rocks. This was satisfactory for the first year, particularly as little publicity was given to the trial before it began in March.

In addition, the Poultry Demonstration Plant provided 3 pens of Black Orpington x White Leghorn pullets selected at random from the normal annual replacement pullets. Results from these birds have not been reported monthly, as these pens could not be claimed to be part of a breeders' laying trial, but the results are included in this report, mainly because of the widespread interest in crossbred pullets.

Districts from which entries were received were Whangarei 1 pen, Auckland 2 pens, Wellington 1 pen, Dunedin 1 pen, Gisborne 1 pen, Hawkes Bay 8 pens, and Manawatu 1 pen.

The pen of birds from Whangarei gave the greatest total of eggs in the trial. If birds are properly crated, no breeder need fear entering a pen on the score of the distance from his railway station to Upper Hutt.

General Management

Each entry of 20 pullets was penned separately in an intensive laying house. Each pen is 14ft. by 13ft., giving ample floor space for the birds. Nest boxes fitted with trap-nest fronts were provided, and careful attention was paid to prevent birds laying on the floor as far as was practicable.

A light grain feed was given early in the morning, followed by a wet mash feed at about 10.30 a.m. Greenfeed was given each afternoon, and the day ended with the usual grain feed. The birds received oyster shell and a hard metal grit as required. On Sundays they were given two full feeds of grain instead of mash and grain. This is a management policy adopted for all laying birds on the Poultry Demonstration Plant. A vitamin A-rich fish oil was fed only during the latter part of the winter, when it was considered desirable even though the birds were receiving daily greenfeed.

The trial opened on March 28, 1949, and ended on February 26, 1950, and was divided into 12 periods of 28 days each for the collection of data.

Results

This trial is not run competitively, but the following table sets out the results according to breeds:—

Pen No.	Total eggs produced	Flock-house average (eggs per bird)	Certificates of merit gained
	WHITE LEGHORNS		
7	3,722	186.1	5
11	3,609	180.4	4
9	3,418	170.9	5
10	3,111	155.5	5
14	2,812	140.6	4
8	2,801	140.0	1
12	2,489	124.4	1
13	2,468	123.3	3
	AUSTRALORPS		
2	3,487	174.3	5
4	3,211	160.5	4
15	3,148	157.4	5
1	2,953	147.6	3
3	2,787	139.3	3
5	2,376	118.8	4
	BARRED ROCKS		
6	2,507	125.3	2

The flock-house average is arrived at by dividing the total eggs produced by the original number of birds in the pen—in this instance 20.

The table on page 333 shows the total egg production of all birds alive at the end of the trial. A figure in bold type denotes that the bird was granted a breeding certificate of merit. To gain a certificate a bird must lay not fewer than 180 eggs each weighing

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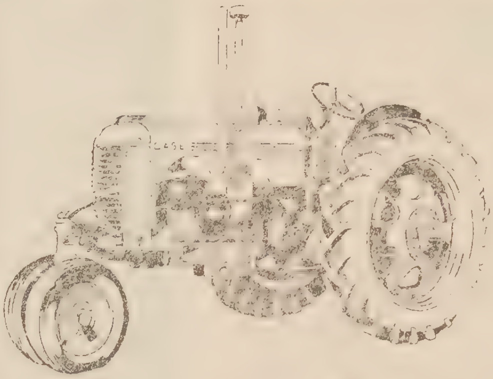

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2oz. or more during the trial and be satisfactory in health, size, type, and colour for breeding purposes.

Some birds are recorded as having laid more than 180 eggs and yet are not credited with a certificate. In many instances that was the result of unsatisfactory egg size; in others the bird either was small or had some defect which spoilt it for breeding. Many of the birds with a production of fewer than 180 eggs are fit for breeding but have not reached the minimum production standard set for the certificate.

Egg Production

Production from the start of the trial and during the winter was not entirely satisfactory, but production at the end of the trial was well maintained. The average production per bird of each breed on a flock-house basis was: White Leghorns 152.6, Australorps 149.6, Barred Rocks 125.3, and crossbreds 147.2. These figures may well appear low to a man accustomed to basing average production on the number of live birds in a pen at a given time—that is, ignoring mortality entirely. The flock-house average is based on the number of birds in a flock at the start of a laying season, thereby taking mortality into consideration. This method affords a true economic picture, as obviously mortality must be taken into account.

Included in the figures for average egg production is one for the 3 pens of crossbreds run in the trial pens. These birds were Black Orpington x White Leghorn pullets. Of these 60 birds 18 laid 180 or more eggs, the highest production being 232 eggs.

Egg Size

About 11 per cent. of the birds alive at the close of the trial consistently laid eggs lighter than 2oz. Doubtless a number of these pullets will lay 2oz. eggs as hens, but the fact remains that they are likely to carry a small-egg factor as breeders and so in turn throw pullets which will lay undersized eggs.

Unrecorded Eggs

Though the use of the trap nest to record egg production is common in laying trials overseas, single penning of birds is customary in New Zealand. If it is considered all-important that not one egg be missed from the record of a bird, single penning is the only entirely satisfactory method of recording, but in the type of trial held at Upper Hutt single penning would be unpractical.

Though every effort was made to avoid unrecorded eggs, the number laid on the floor and therefore unrecorded by the trap nests during the 48-week period was 3.1 per cent. of the total eggs for all pens—by coincidence, 3.1 per cent. for the heavy-breed pens and the same for the light breeds. This represents an average loss of 4 eggs to each bird's record. Obviously in practice many birds lost nothing because of unrecorded eggs and others had a greater loss than 4 eggs.

Food Consumption

During the trial a close check was kept on the amount of mash and grain eaten. The table on the next page sets out the total food consumed and the average amount eaten daily per bird for each of the 12 periods:—

LAYING TRIAL FOR BREEDING PULLETS

A breeders' laying trial pen photographed from the feeding passage at the back of the laying house.

BREEDER	BREED	PEN	RING NUMBER AND 48 WEEKS' PRODUCTION OF EACH BIRD																		
Brice, R.	A.	1	101	102	103	104	106	107	**103**	109	110	111	112	**113**	**114**	116	117	118	119	120	
(Hastings)			124	168	167	131	164	136	**209**	120	152	30	165	**193**	**183**	128	191	179	106	156	
Smith, A. J.	A.	2	**121**	**123**	124	125	126	127	128	129	130	131	132	133	134	**135**	**136**	**137**	139	140	
(Hastings)			**188**	**198**	154	203	125	172	146	170	212	133	175	255	236	**184**	**204**	**219**	170	167	
Young, G. H.	A.	3	141	**142**	143	144	145	146	148	149	**150**	151	**152**	153	154	156	157	158	159	160	
(Wellington)			142	**213**	167	185	143	57	161	75	**223**	120	**215**	111	110	160	151	160	186	163	
Boyce, W. L.	A.	4	**161**	162	163	**164**	**165**	166	167	**168**	169	171	172	173	174	175	176	177	178	179	180
(Hastings)			**193**	190	160	**209**	**203**	150	167	**193**	100	116	134	141	135	136	150	174	65	173	149
Murton, W. M.	A.	5	181	182	**185**	186	187	188	189	**191**	192	**194**	196	197	199	**200**					
(Hastings)			169	142	**200**	128	51	111	170	**217**	117	**188**	175	103	158	**240**					
Willers, R.	A.	15	**441**	442	443	444	445	446	**447**	448	**449**	450	452	454	**455**	456	**457**	458	459	451	
(Feilding)			**201**	100	209	113	152	185	**154**	144	**201**	100	114	131	**232**	208	**185**	220	168	141	
Nielsen, J.	B.R.	6	201	202	205	206	**208**	209	210	212	213	216	**218**	219							
(Henderson)			219	132	238	113	**210**	237	230	231	141	233	**229**	178							
Wade, G. W.	W.L.	7	222	**223**	**224**	225	**226**	227	228	229	230	**231**	232	233	235	**236**	237	238	239	240	
(Whangarei)			153	**237**	**221**	178	**191**	208	227	154	147	**204**	148	152	123	**206**	175	187	217	131	
Hetherington, R. W.	W.L.	8	241	242	243	245	246	249	**252**	253	254	255	256	257	259	260					
(Henderson)			215	154	190	146	189	182	**192**	123	146	173	143	173	121	179					
Friis Brothers	W.L.	9	261	262	263	264	265	266	267	**269**	270	**271**	**272**	**273**	276	**278**	279	280			
(Hastings)			138	179	189	96	203	217	75	**224**	224	**180**	**232**	**208**	192	**223**	244	171			
Anderson, E. P.	W.L.	10	281	282	283	284	285	286	**287**	288	289	**290**	291	**293**	**294**	295	296	**298**	299		
(Dunedin)			208	169	115	164	114	191	**223**	210	155	**187**	6	**182**	**182**	216	152	**231**	178		
Bolton, T. A.	W.L.	11	**301**	302	303	**304**	305	306	**307**	308	309	310	313	314	315	316	317	318	**319**	320	
(Gisborne)			**187**	165	127	**189**	152	174	**206**	229	129	171	178	162	142	166	243	163	**204**	204	
Greenfield, E. B.	W.L.	12	322	323	324	325	326	327	328	329	**330**	332	333	334	335	336	338	339	340		
(Poukawa)			174	137	152	97	190	84	157	119	**201**	182	51	59	137	198	118	158	65		
Boyce, W. L.	W.L.	13	341	343	**345**	348	349	350	351	353	355	**356**	**357**	359	360						
(Hastings)			171	175	**209**	63	152	108	175	89	170	**201**	**185**	140	134						
Crawford, A. C.	W.L.	14	421	422	**423**	424	425	426	427	428	**429**	431	432	433	434	**435**	**436**	438	439		
(Hastings)			197	85	**213**	154	160	109	199	143	**191**	143	104	94	175	**181**	**217**	145	97		

A. = Australorp. B.R. = Barred Rock. W.L. = White Leghorn. Upper figure = Ring number. Lower figure = Total eggs laid. A figure in bold type indicates that the bird received a certificate.

LAYING TRIAL FOR BREEDING PULLETS . . .

Period			Food per bird (lb.)	Food per day (oz.)
1	..	..	6.46	3.7
2	..	..	8.37	4.7
3	..	..	7.27	4.1
4	..	..	7.10	4.0
5	..	..	6.81	3.9
6	..	..	7.21	4.1
7	..	..	7.70	4.4
8	..	..	7.70	4.4
9	..	..	7.69	4.3
10	..	..	7.45	4.2
11	..	..	7.60	4.3
12	..	..	7.69	4.4
		Total	89.05	

Of the 89lb. of food eaten per bird in the 48 weeks 47½lb. was grain and 41½lb. was mash. Allowing for the changes in prices of both grains and mash during the past 12 months, and taking cost figures for grain and standard poultry laying mash No. 1 in the Wellington area, the cost of feeding per bird for 48 weeks was 15s. 8d.—8s. 1½d. for grain and 7s. 6½d. for mash.

The grain ration for each bird for the 48 weeks was in the ratio of 80lb. of wheat to 20lb. of barley.

The fact that grain only was fed on Sundays accounts for the quantity of grain eaten being greater than that of mash.

Mortality

Losses from all causes during the 48 weeks totalled 52 birds—a mortality of 17.3 per cent. This figure must be considered high, though not out of proportion to figures recorded overseas before the war. Analysed according to breed, the percentage of mortality was: Australorps 12.5, White Leghorns 18.1, and crossbreds 20.0.

Every bird which died or was killed was sent to the Animal Research Station, Wallaceville, for post-mortem examination. Following is a summary of the reports received setting out causes of death or, in the case of birds which were killed, their condition:—

Leucosis (including fowl paralysis, big liver, etc.)	17
Tumours	5
Intestinal coccidiosis	6
Tuberculosis	1
Impacted oviduct	2
Egg peritonitis	5
Prolapsus	2
Vent picking	1
Ruptured liver	2
Toxaemia of unknown origin	1
Breakdown in liver	1
Congested lung	1
Cause unknown	8

These figures reflect the relative importance of diseases known to be present in flocks in New Zealand, though they do not include diseases affecting chicks and young growing stock. Furthermore, the greater loss among White Leghorns is in accord with reports of field officers that owners of Black Orpingtons or Australorps do not in general suffer as heavy losses as are sustained in the average White Leghorn flock.

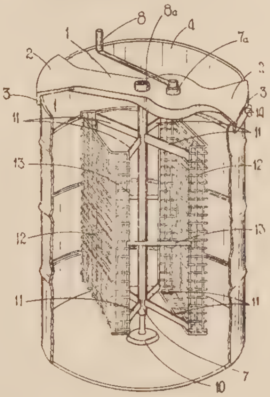
The 1950-51 Trial

The new trial began on March 13, and 23 pens have been entered, an increase of 8 pens on the figure for 1949-50. The new entries consist of Australorps (5 pens), Rhode Island Reds (1 pen), and White Leghorns (17 pens).

Recent Patent Specifications for Farming Inventions

The following particulars of recent patent applications of interest to farmers have been selected from the Patent Office Journal issued on January 27 and February 20, 1950, and are published by permission of the Commissioner of Patents, Wellington. Photostat copies of any specifications will be supplied for a small fee on application to the Patent Office.

No.	Description.	Applicant.
98902	Centrifugal Honey Extractor,	S. Williams.



[Only those references which are necessary to an understanding of the specifications are quoted in the abridgment below.]

In honey extractors of the type using centrifugal force to gain honey from the trays or comb frames and incorporating a platform 1 across the open end of the receptacle 4, a shaft 7 turnably mounted in the platform and extending into the receptacle 4, means 8 on the platform for turning the shaft, frame members or brackets 11 are oppositely disposed about the shaft and extend a greater distance from the shaft on one side than on the opposite side. Holders 12 for honey trays or comb frames are attached to the frame members. The holders are therefore out of balance, thus adding to the momentum of shaft 7.

No.	Description.	Applicant.
89189	Method and Apparatus for Treatment of N.Z. Flax,	E. Ainsworth.
90285	Aromatising Edible Fats,	Aktiebolaget Separator.
90826	Fluid Pressure-operated Cheese Press,	The National Dairy Association.
90907	Foot Anchor for Fencepost,	Titi Tihu.
91333 94089	Treating Metal Surfaces used in Buttermaking,	Ecremeuses Melotte Societe Anonyme.
92016	Tractor-trailer Hitch,	H. Ferguson Inc.
92433	Exhaust Cover for Tractors, etc.,	W. Wallace.
92587 92588	Teat-cup with Squeezing Fingers,	C. G. Howse.
94095	Rack for Milk Buckets,	J. L. Kjeldsen.
96309 96311	Fertiliser Spreader,	G. O. Hoffstetter.
97092	Packaging Spray-dried Milk Powders,	The Borden Company.
98441	Scoop Attachment for Tractor,	Ottawa Steel Products.
99589	Plant-setting Implement,	W. C. Ritchie.
101643	Tether for Livestock,	J. H. Taylor.
92947	Earth-working and Carrying Scraper,	R. G. Letourneau.
94125	Shear Sharpener,	J. D. B. Joseph.
94187	Fertiliser Distributor with Crushing Rollers,	G. R. Strong.
95272	Cable-operated Shovel or Crane on Truck,	J. M. McC. Stevenson.
96441	Ditch-cleaning Attachment for Tractors,	J. R. Hodge.
96715/6	Rotary Hoe (Single-wheel Type),	Howard Auto Cultivators Ltd.
96995	Vacuum Break Means for Milking Machines,	L. H. Berkahn.
97425	Combination of Cultivator and Sower for Grassland,	H. B. Tennent.
97578	Ditch-clearing Implement,	Canterbury Agricultural College.
97715	Hydraulic Cheesepress,	J. B. Macewan and Co., Ltd.
98191	Mowing or Pasture-topping Means,	J. B. Powell.

BOOK REVIEW

"VEGETABLE CROPS": H. C. THOMPSON

WITH the publication of the fourth edition of "Vegetable Crops," by Professor H. C. Thompson, the New Zealand market gardener is presented with an up-to-date, authoritative treatise covering most aspects of the vegetable production industry.

The author has incorporated conclusions gleaned from a careful study of the published results of scientific researches by numerous authors in a way that makes his book interesting not only to the scientific worker but to the man engaged in actual production.

For those who require a clear general picture of the basic principles underlying successful vegetable growing this book has few equals. It combines both the theoretical and the practical aspects of the industry in a most satisfactory manner.

Although written primarily as a text-book for American readers, the book contains much useful information for New Zealanders. Practically all vegetables produced in temperate regions today are described and the more important species are dealt with in some detail. The book is particularly well arranged, contains numerous illustrations, and discusses types of vegetable production and the factors influencing each, modern methods of disease and pest control, irrigation, cultural treatment, harvesting, and storage of crops.

—*F.M.B.*

McGraw-Hill Book Co. Inc., New York.

JUTE GROWING IN PAKISTAN

By B. N. EADE.

BECAUSE jute is used extensively for wool packs, the outcome of the jute trade talks between India and Pakistan is of vital importance to New Zealand wool growers. Eastern Pakistan produces about two-thirds of the total jute crop and India about a third, and the partition of India has raised problems, as the jute mills are in West Bengal (India). India must purchase raw fibre for her mills and Pakistan must sell fibre to buy food for the jute cultivators. The devaluation of sterling and the Indian rupee has brought further problems. Indian mills are refusing to buy raw jute, as they claim that the price on the new basis of exchange is uneconomic. All trade has stopped and though the mills have sufficient stocks for some months, the cultivators in Pakistan have no reserves and must sell their product to buy food. The talks already mentioned are expected to produce a solution to the present impasse.

THE rich soil of the Ganges delta and the humid weather, heavy monsoon rains, and annual low-rising inundation lasting 5 months experienced there form an ideal environment for growing first-class jute. Jute can be, and is, grown on dry land where there is a humid climate and very heavy rainfall, but the quality of the fibre is inferior.

Preparation of Land

Thousands of acres of jute are put down in February. The land is reduced to a fine tilth by being ploughed and cross-ploughed five times with age-old wooden ploughs drawn by cattle. Bamboo tine harrows are used to break down the lumps that are soft, but the big, hard ones are pulverised by a man with a type of wooden mallet who follows the plough and smashes the lumps one by one.

After cutting, the stalks are tied in bundles and towed to deep and safe water.

Though primitive, this method of cultivation is effective and is feasible where labour is so plentiful and so cheap.

The crop, which is hardy and a vigorous grower, makes rapid headway. It is weeded and thinned by hand, the operators using a type of trowel. By June the long, thin stalks (one to each plant) are 3ft. to 4ft. high. Thinnings are often used as a vegetable. In June the water rises and when this occurs no more weeding or cultivation is done. The plant grows ahead of the water rise and thrives in water.

Cutting the Crop

In early August a very light cutting is made and, as the cutting must be at ground level, the cutter often has to reach down under the water as he works. By the end of the month the main cutting is in full swing. The cut jute is tied in bundles and built into rafts, which are floated to quiet and safe water and sunk there under green weeds or sods. It remains retting in the water for three weeks, after which it is taken up on to the nearest high land, usually a road, and the long fibre stripped from the central pith, which is kept for firewood and for use as house walls.

Cutting jute; the stalk is cut level with the ground.

Men, women, and children help with the stripping, with which is associated a stench from the decayed vegetable matter and muddy water that pervades the countryside. After stripping, the fibre, which is as long as the plant (6ft. to 12ft.), is washed by being swirled rapidly from side to side in water. Its white nature then begins to show and after it has been dried in the sun a good fibre shows white and clean and looks like a clean flax fibre, though it is much softer and more easily worked.

By mid-September the higher fields from which jute has been cut have been "ploughed" again, which means that the knee-deep mud is stirred, and young rice plants are sown by hand. Rice, which is harvested from these fields in December and January, is a subsidiary crop to the main crop sown earlier.

Must Import Rice

So much jute is grown in East Bengal that rice must be imported or there would be wide-scale starvation. The main wealth of eastern Pakistan comes from the sale of jute fibre. Because of the situation which has arisen jute producers are already hard hit.

It has been suggested that the Pakistan Government should purchase the whole of the jute crop. Pakistan has been trying to purchase jute mills and, though India is unco-operative, the Pakistan administration hopes to secure machinery from Dundee, which is an important jute-manufacturing centre. Pakistan will undoubtedly forge ahead with the building up of her own jute industry, which will assist in solving her unemployment problem and in raising the economic level of the country. India is increasing her jute acreage, but there is not an unlimited market for jute, as cheaper substitutes are appearing. It would appear that the jute industry is likely to be centred in East Bengal.

When packed in bundles jute is ready to be taken to the bazaar for sale to brokers who sell it to sorting and baling firms; the latter in turn sell it to the mills making jute goods, such as wool packs.

Sling for Sheep

By D. G. AUSTIN, Sheep and Wool Instructor, Department of Agriculture, Auckland.

COSTS in labour and materials can be offset to a considerable extent by the farmer who uses labour-saving devices. A sheep farmer will welcome anything which helps him in his busy seasons such as lambing, shearing, and dipping. This article describes a new device to help the farmer, the sheep sling, for treating cast sheep and mothering up lambs.

A ewe supported in the sling described in this article.

AS stock prices are as high as at any time in the history of New Zealand farming, anything that will reduce losses or make it possible to give more attention to the flock is an asset to any farm and a contribution to the whole sheep industry. The sheep sling illustrated was the outcome of the experiences of a Northland farmer who over several seasons had serious losses in his flock through bad weather and lambing troubles. Shortage of labour was his main difficulty; he could not spend a great deal of time over one cast sheep or on mothering up a ewe and lamb without neglecting the rest of his flock.

On many occasions he found cast ewes, frequently those carrying twins as well as heavy fleeces, seeking shelter in out-of-the-way places. Sometimes he succeeded in saving the sheep, but more often, after wasting valuable time on them, he failed. The sense of frustration was as serious as the time wasted, and in addition there was the loss of a valuable animal.

While watching ewes staggering drunkenly and falling it occurred to the farmer that it should be possible to build a portable support. The ewe could be put in it, and could be attended to later when circulation and strength had returned. A device was built and proved successful at the first trial. By the end of the season a dozen ewes had benefited by the same treatment.

Mothering of Lambs

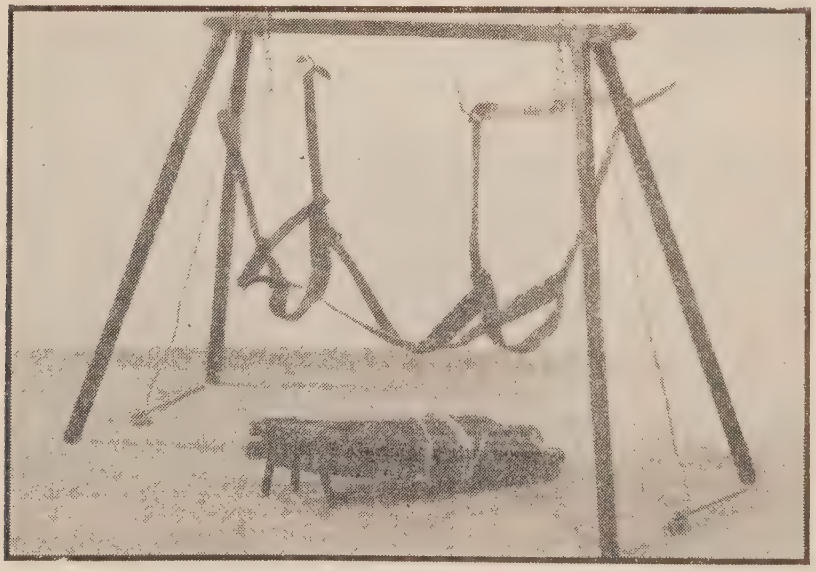
The next step was to use the device for mothering and adoption and this proved easy. No two-tooth ewe that would not take her lambs failed to be "conditioned" when placed in the sling for 24 hours or even less. It gave the lambs complete and easy access to the mother and a good start in life. The ewe was soon reconciled when she found that she could not kick or run away.

The sling was used in many cases for the adoption of lambs, and the mothering of a twin to a ewe whose lamb had died gave the minimum of trouble. This method seems easier than that of skinning dead lambs and tying the skins on to lambs which have to be mothered up to aid adoption, when the ewes have to be tied to a fenceline. A lamb mothered up in this way must be hand fed from time to time when the foster ewe is uncooperative.

It seems likely that the sling would also be of value in the first few hours after replacing a slipped bearing. The animal can be placed in the sling so that its tail end is higher or lower than the rest of its body, which may reduce some of the pressure on the bearing.

Several problems had to be overcome in making the sling. First, in order to be practical, it had to be of simple construction, durable, easily repaired, and, if possible, made of materials that were readily procurable. Above all, its cost had to be reasonable. The patentees now claim that, after 12 months of experiment and testing, the device has proved satisfactory in the respects mentioned.

Although the frame is constructed of wood and weighs only 10lb. it supports the weight of a 12½-stone man. When folded up with the legs fitted in close to the main cross-bar the sling fits easily into a carton 42in. x 6in. x 6in. For carrying on horseback the device folds up into a compact bundle 21in. x 8in. x 6in. and it is constructed so that this involves very little loss of strength. Two slings in a split sack, for use in more open horseback country, would scarcely be noticed by the rider. There is nothing in the outfit that the farmer cannot repair in the event of breakages through wear and tear. Perhaps what is most important is that the manufacturers claim that, by mass-production methods, the sling can be produced at a cost to the farmer of little more than the price of two average ewes.



[*Christopher Bede Studios Ltd. photo.*

The sling assembled and (below) folded for transporting.

Danger Seen in Propagation of Manuka Blight

PUBLICITY now being given to the so-called "manuka blight" and to its use in destroying manuka on pasture land merits very careful examination in the light of the position which this plant occupies in the vegetation of New Zealand. Recognising both the value and the danger of control measures of this type, a committee of representatives from interested Government Departments met recently, under the auspices of the Soil Conservation and Rivers Control Council, to consider the implications of the dissemination of insects for manuka destruction. The conclusions unanimously arrived at by this committee, and approved by the council, are set out in the following statement:—

TO the farmer manuka is a weed which invades some pastures and ultimately may take control of them unless it is held in check rigorously. To the forester and botanist who are concerned with regeneration problems manuka constitutes an ideal nurse crop for kauri, rimu, beech, and many other native trees. To the soil conservator manuka is a type of cover which helps to reduce erosion and run-off on poor, reverting, hill country. Thus it is evident that manuka in its right place is of the utmost value from the point of view of forestry and soil and water conservation; in the wrong place it can become a serious problem in pasture management.

Protective Value of Manuka

Therefore, though the destruction of manuka is eminently desirable on many thousands of acres of grassland, it is relevant to consider what would happen if the many millions of acres of land submarginal or uneconomic for farming were stripped of the protective covering which this plant affords. Statements have been made that when manuka is removed grasses or useful shrubs automatically come in as a replacement, but the only evidence to support these contentions is found on small areas which are by no means representative of the vast tracts of manuka heath. These mixtures of fact and conjecture have led to dangerous conclusions about the use of the manuka blight, and it can be stated bluntly that no reliable information as yet exists about the plants which would follow such a major crisis in the New Zealand flora. Much would depend on the seed in the ground, on the species which seeded into the area, on the treatment which the land received, and on climatic and soil conditions. In certain circumstances native grasses might come in extensively; in others fern might become dominant; again, exotics such as gorse or blackberry might take charge. On some of the poorer sandstones the result, at any rate for a considerable time, might be bareness, relieved only by lichens and other primitive forms of plant life.

Though death from manuka blight is not sudden but progressive over a number of years, it is therefore certain that if this disease reached epidemic proportions, a new approach would have to be made to the problems of regenerating native forests. It is also probable that for many years, until a new plant cover had been established, very serious soil erosion and flooding problems would be created. When account is taken of the large areas where manuka is nursing native forest crops and where it is conserving soil and water resources, it becomes evident that without more information on the possible effects of a large-scale death of manuka it would not be in the best interests of the country to encourage the spread of the blight.

Place in Country's Vegetation

In the view of the farmer the control of plant pests must naturally rank high, but it is not always realised that the problems of manuka invasion differ intrinsically from those of most other weeds. Unlike most of them, manuka is not an introduced species but a native, and through countless ages it has won for itself a definite place in the vegetation of New Zealand. In the past it occupied considerable tracts, particularly in the North Island, and at present it covers even more extensive areas, including those where settlers felled and burnt the forest but failed to establish permanent farm land.

This fact places manuka in a very different category from most other weeds. It belongs to this country, and if disease wiped it out, the effect on the vegetation with which it had been so long in association might indeed be disastrous. Already, during the short period of European occupation, the balance achieved by Nature has been upset seriously through the activities of man and the plants and animals he has introduced, and no thinking person can regard the present pattern of vegetation as either reasonably stable or healthy. For this reason, until more is known of the interaction between these plants, it would be unwise to aid a disease which might bring about the death of one of the most widespread components of this vegetation.

Effect of Soil Fertility

Another consideration also concerns the farmer in his fight against manuka. It is established that where soil fertility is high and a dense pasture sward covers the ground manuka does not give serious trouble; it cannot compete with grasses and clovers in such conditions. Where, however, the soil is poor and the pasture run down, whether because of over-grazing and repeated burning or because of circumstances over which the farmer has no control, ideal conditions exist for manuka invasion and pasture plants may be smothered in a few years.

The inference is that on land which is reasonably economic for farming manuka can be held in check by top-dressing, by sowing pasture mixtures, and by clean and sound farming practices. On the other hand, it is doubtful if the use of the blight will be of any real benefit to poor land unless steps can be taken to improve the soil, for if the manuka is killed out and no further action taken to stimulate pasture species, re-invasion by manuka or by some other weed is likely to be the only result.

Danger of Introducing Insects

Though the evidence is not yet conclusive, it appears that the scale insect responsible for the death of manuka is not a native of New Zealand, but probably came from Australia. Therefore, the blight must be considered in the same category as all other introduced plants and animals. Experience has shown the danger of the uncontrolled and unrestricted introduction of many plants and animals which later have become weeds and pests, and to take unnecessary chances with the manuka blight would be rash. Already the insect is established firmly in parts of the South Island, and its spread by natural means can be arrested only with difficulty. Therefore, until a great deal more is known of its life history and habits, deliberate dispersal of infested plants can be regarded only as foolish and short-sighted.

Conclusions Reached

In summarising the position regarding the use of the blight in controlling manuka, four important conclusions have been reached:—

Manuka serves a most useful purpose on vast areas of poor country by promoting forest regeneration and reducing soil losses and run-off.

Where it is economic, good farming is the most effective means of preventing manuka invasion, and the blight cannot be considered as an alternative.

The artificial propagation of a plant disease about which so little is yet known is fraught with danger.

Though manuka blight might be of immediate advantage to some farmers, its widespread distribution is likely to prove disadvantageous to the country in the long run.

In the present state of knowledge it is considered unwise to foster and distribute the manuka blight, and until the results of investigations now being made are available, farmers are urged, in their own interests and in the interests of New Zealand's vegetation as a whole, to refrain from trying to use the blight beyond the range of its spontaneous occurrence.

V Drains Cut with a Bulldozer on Light Country in Manawatu

By

A. J. GALPIN, Fields Instructor,

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THOUGH light soils generally are free draining and seldom require underground drainage, open drains are often needed to carry off surplus water during heavy rains and to lower the watertable in winter where such land consists of extensive areas of flats. On large areas of flat land on coastal sand country drainage often is impeded by the formation of a pan or by adjacent sandhills barring the flow of water off the land.

THE usual type of open drain with straight or battered sides is a constant source of trouble on these light lands, as the sides keep falling in and breaking away and they need continuous attention and cleaning. To overcome this difficulty in the development of large areas of sandy flat country on the west coast of the Manawatu, a bulldozer has been used to make V-shaped drains with gently sloping sides which are grassed with the rest of the paddock. Where the flow of water is intermittent, as often is the case, the bottom of the drain can also be grassed with such species as paspalum and strawberry clover, both of which will stand immersion in winter for several weeks.

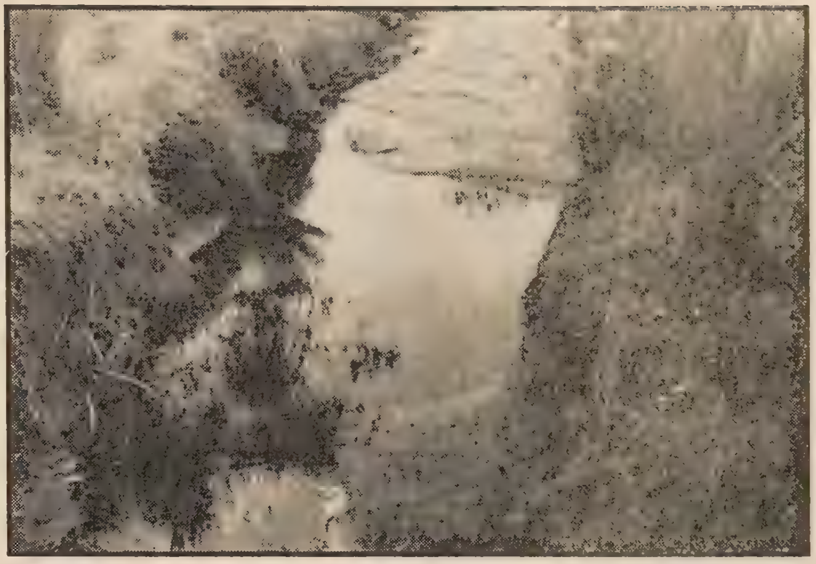
The drains have a much greater capacity than ordinary open drains and when once successfully grassed require little or no maintenance.

The first cut is made along the centre line and one side is then formed at a time.

The usual grassland implements such as mowers, sweeps, and harrows can be used across or along the drains, which need not be along fence lines, but can be anywhere in the area to give the best results. The drains are made to the depth necessary to lower the water-table to the level required. The sides are given a batter sufficiently gentle to be easily negotiable with farm implements and tractors.

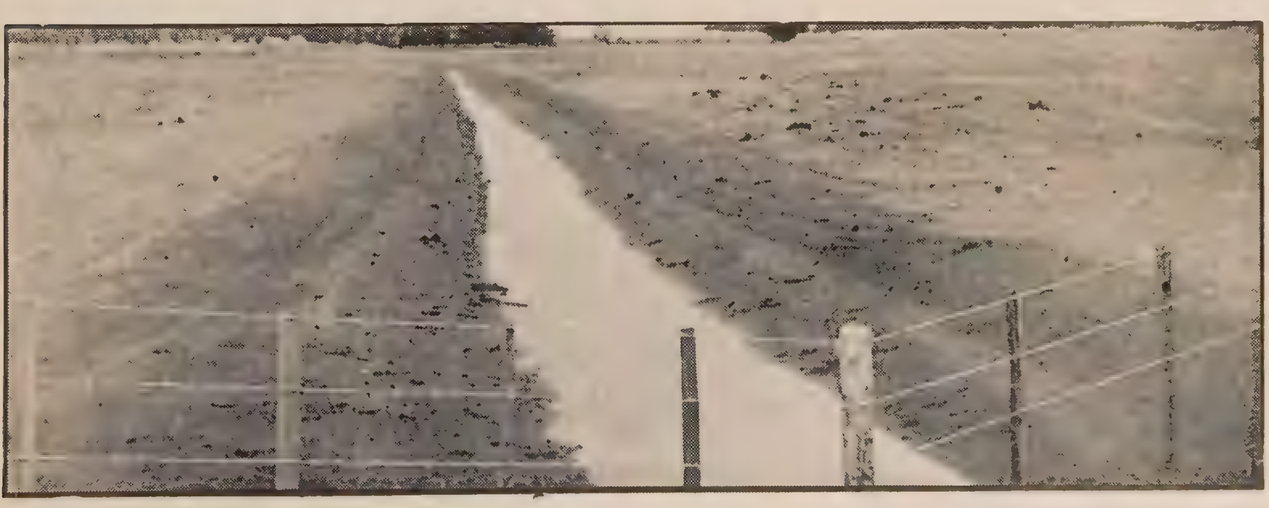
Though such drains have been in use for some time and special implements have been made for cutting them, only quite recently have really big drains to take the water off large blocks of flat sand country been put in by a bulldozer. The illustration below shows one of these bigger drains, about 6ft. deep, which was put in across flats and through low sandhills a distance of some 80 chains at a cost of £2 10/- per chain.

This method of drainage can also be used on heavier types of soil, and a number of such drains have been made on the silt and clay soils of the Manawatu, but it is in the drainage of really light land that the method has considerable advantages over the old method of digging straight-sided drains.



Typical filling in of open drains on sandy soils.

Above—Taking water through sandhills to the sea. The sloping sides will be planted to marram grass and lupin. Below—A V drain on pure sand before the grassing of the sides.



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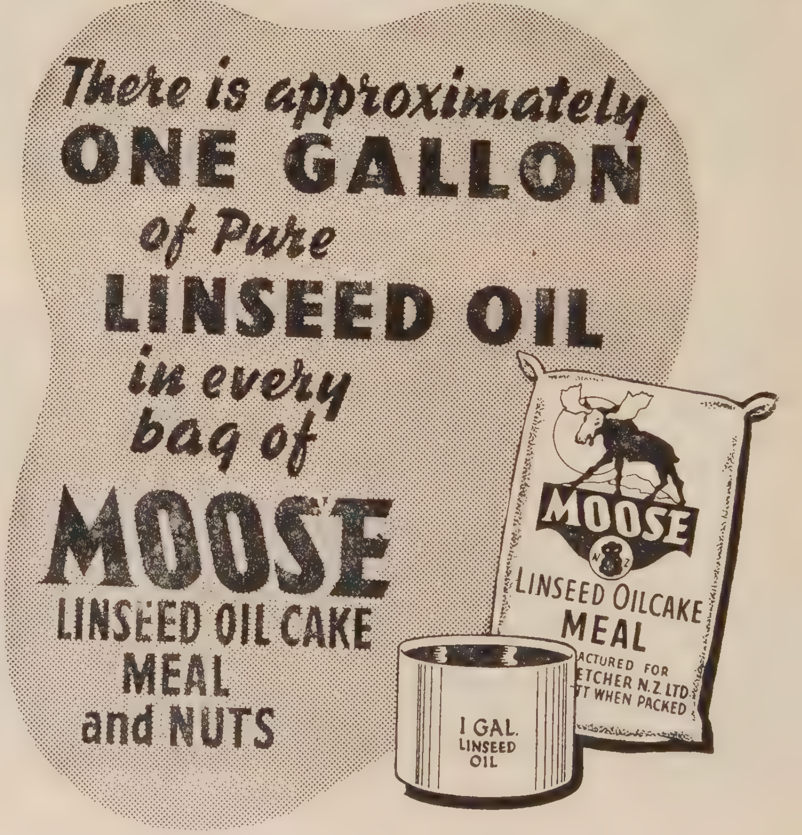

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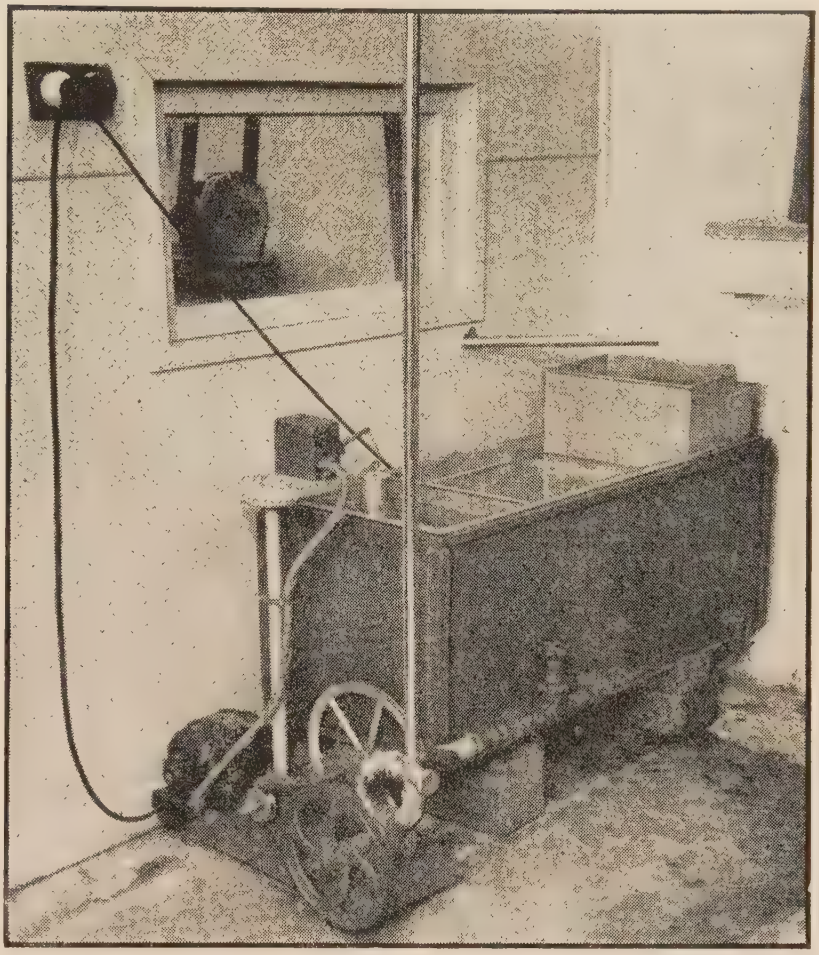
Honey Pump with Automatic Control

By C. R. PATERSON, Apiary Instructor, Department of Agriculture, Hamilton.

THE honey pump plays an important part during extracting time in relieving the beekeeper of much heavy lifting, and automatically controlled units are now meeting with favour because of their efficient operation. This article deals with a controlled pumping unit, used in conjunction with the honey heater and clarifier described in the March issue of the "Journal."

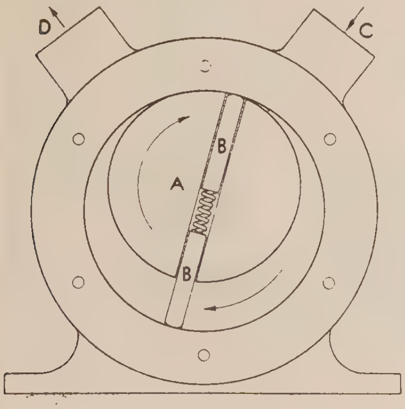
THE most exacting time for the beekeeper is when the honey crop has to be collected from the various apiaries and extracted in the honey house. This period generally coincides with a time when the weather is fine and temperatures are high. The lifting of supers of honey in the field under these conditions cannot very well be avoided, but with intelligent planning in the honey house much heavy lifting can be eliminated. Why lift tons of honey up into the honey tanks as it comes from the extractor when a honey pump will do it? There is no doubt that lifting about 50lb. of honey high above the head to reach the top of the honey tank creates a greater strain on the beekeeper than any other form of lifting he meets with in his work. The two-level or gravity type of honey house was designed years ago to overcome all this lifting, but the trend today is for a single-floor honey house with mechanical means of lifting the honey from the extractor through a straining unit to the honey tanks.



Automatic pumping unit fitted to a heater and clarifier. All extracting work is done in the next room.

Construction of Honey Pumps

Honey pumps are specially designed to deal with a viscous fluid, and pumps that are constructed to move water or oil are not considered suitable for handling honey. Honey pumps are simple in construction, with very few working parts, and give very little trouble if the pump is kept as close as possible to the source of supply and all connections are made absolutely tight.



The diagram below, which shows the working parts of a honey pump, indicates that the rotor A is off centre to the inside bore of the pump. The slides BB are pressed against the sides of the pump by means of two small but fairly strong springs. No matter what position the rotor is in, the slides keep their pressure against the wall of the pump. It is by this means that the pump is able to handle sticky liquids. If honey flows into the pump at C the rotor should move in a clockwise direction. This will allow the slide B, as the spring presses it against the side, to force the honey round the pump until it comes out at D. By this time more honey has flowed in and is moved by the second slide. Should the rotor move in an anti-clockwise direction, the honey inlet will be D and the outlet C.

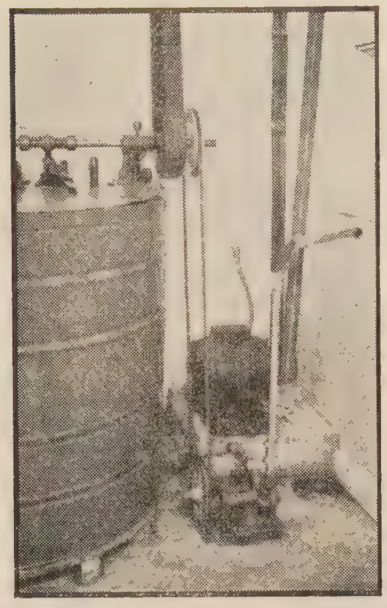
As the slides BB can only move honey that has flowed into the pump, it is necessary when installing a pump to see that the intake is as short as possible, because honey does not flow readily through a pipe unless pressure is applied.

The speed of the pump influences its efficiency, because if a pump is rotating too quickly not sufficient time is allowed for honey to flow into and completely fill the pump, whereas by reducing the speed it will be found that the slides have a full compartment of honey to deal with on each revolution. A pump speed of approximately 40 to 50 r.p.m. appears to give best results. A greater speed, if necessary, can be used with warmed honey.

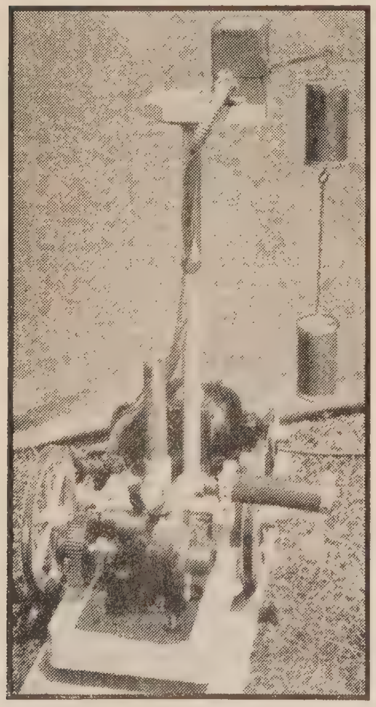
Methods of Installing Honey Pump

One method of installing a honey pump is to have the pump closely connected to the honey extractor and drive it off the countershaft. The belt is slipped on and off according to how much the pump is required. This is not a desirable set-up, because the belt very soon gets slack and there is a constant need for re-adjustment. Also the practice of handling a belt on a moving pulley creates a definite hazard which should be avoided.

CONTROLLED HONEY PUMP . . .



Honey pump fitted direct to extractor and delivering honey to heater and clarifier in next room. The belt has to be slipped off the driving pulley if it is necessary to stop the pump while the extractor is running.

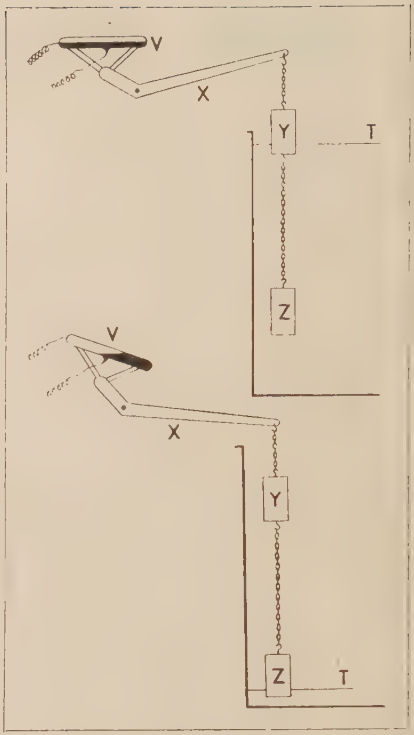


Pumping unit with automatic control fitted. The arm carrying the weight and float reaches over into the honey tank.

An improved method is to have the pump coupled to an independent electric motor, as this enables the beekeeper to switch the unit on or off as required. Because of the low speed at which a pump requires to be run, it is not possible to run it direct off a motor, but this can be attained by means of a countershaft, the use of which is necessary to get the required speed. An illustration of a compact unit using a ¼ h.p. electric motor is shown on this page.

A motor with a 2in. V pulley drives on to a 12in. pulley on the countershaft, while a 2½in. pulley on the countershaft drives on to a 10in. pulley on the pump. V pulleys and belts give a very silent and efficient drive, a shield can be placed over the whole unit to cover the moving parts, and a unit of this type is mobile and can often be used for pumping honey from one tank to another, if required.

The unit when fitted with an automatic motor control gives the beekeeper a greater range in the set-up of his honey house; it allows a straining unit to be used and the outfit to be completely controlled by the automatic pump. This control can be purchased from merchants dealing in machinery and pumping equipment and is generally set to switch in the motor when the lever is down. The beekeeper requires the motor to start the pump when the tank compartment is full or when the lever is up. This means reversing the mercury tube in the control. As this is a delicate operation it should be left to the electrician who is doing the installation.

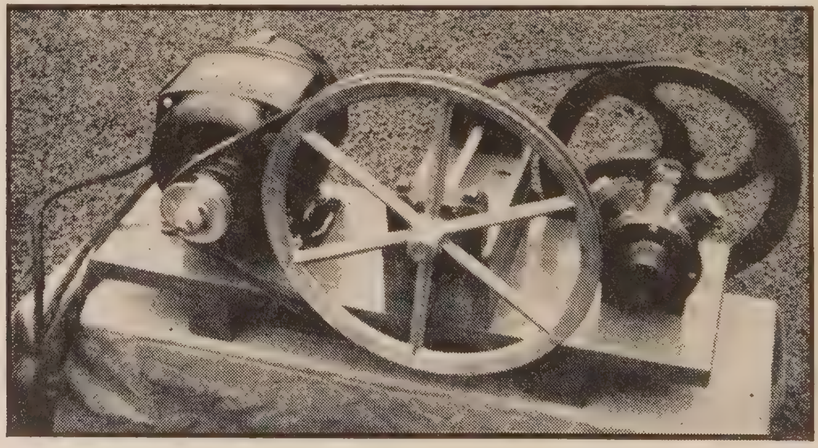


The diagram above shows how this control works. Attached to arm X is a glass tube V partly filled with mercury. When this tube is level the mercury stretches the full length of the tube, thus connecting the two terminals and allowing current to flow to the motor. When the tube is tilted up at one end by means of the lever the mercury runs to the lower end, thus breaking the circuit and stopping the motor. The movement of the tube is governed by the two containers, Y and Z, which are connected to arm X, as shown, by adjustable chains. Z is weighted so that when the honey reaches a low level the weight causes the lever to fall, tilting the mercury tube and stopping the motor. T indicates the level of honey.

As the honey starts to rise again the weight of Z is sufficient to keep the lever down until the honey comes into contact with the float Y. The buoyancy of Y soon overcomes the weight of Z and the lever moves up, bringing the mercury tube into a horizontal position, allowing a flow of current to the motor, thus starting up the honey pump.

With a control of this type the beekeeper is assured of a reliable pumping unit, and one that will allow plenty of latitude in re-designing the layout of equipment in the honey house.

Thanks are expressed to Mr. J. D. Lorimer, Hoopers Road, Hamilton, for allowing photographs of his equipment to be taken.



An independent pumping unit, showing motor, countershaft, and honey pump.

SUGAR BEET

By G. A. BLAKE, Instructor in Agriculture, Department of Agriculture, Matamata.

THE total acreage of sugar beet grown in New Zealand progressively declined from a peak of 452 acres in 1939 to 202 acres for the 1942-43 season, mainly because of a shortage of labour at that time and not from any failure of the crop to fulfil the objective for which it was grown; but the acreage has now stabilised at about 300. As the value of the crop is becoming more fully realised, the area is now tending to increase, and a definite relationship exists between the area sown and the number of breeding sows kept. With the reduction in the acreage of sugar beet, breeding-sow numbers declined from 99,648 in 1939 to 67,938 in 1947, but there are indications that sow numbers are also increasing again.

IT is not generally recognised that sugar beet produces more actual food per acre than most other crops grown for the feeding of stock. A good crop of 30 tons per acre gives 10,000lb. of starch equivalent, equal to 6.1 tons of barley; a 60-ton crop of mangolds produces 9100lb. of starch equivalent, equal to 5.5 tons of barley; carrots at 40 tons per acre produce 7850lb. of starch equivalent, equal to 4.7 tons of barley, and artichokes at 10 tons per acre produce 3670lb. of starch equivalent, equal to 2 tons of barley.

The superiority of sugar beet as a food producer is thus clearly indicated and the crop should occupy a more important place in the cropping schedule on all dairy farms where pigs are kept.

Preparation of Seed-bed

Sugar beet is a deep rooter and can be grown successfully wherever mangolds thrive. It prefers a deep, free-draining, fertile soil; heavy clay soils and peat areas are unsuitable. Districts of excessive rainfall and cold temperatures are to be avoided, as poor crops usually result.

The selected area should be skim-ploughed in the early winter, or the turf heavily disced, followed by a deep ploughing in July or August. In districts where the turf breaks down readily, deep ploughing without prior skimming or discing may be carried out in September and the crop sown about a month later. Where this procedure is followed preference should be given to an area on which the dairy cows were wintered so that the crop may benefit from the accumulation of animal droppings.

Sugar beet requires a fine, firm seed-bed and all cultivation after ploughing should be to this end. A final rolling immediately before sowing will help to provide the firmness and will bring moisture to the surface for good germination.

Where the first crop has been produced disease-free a second crop may be grown on the same area, but the deep ploughing should be omitted for this crop, owing to the likelihood of previously buried weed seeds being brought to the surface where they will germinate and compete with the crop.

Deep cultivation with either a fixed-tine or spring-tooth cultivator, followed by the discs, harrows, and roller, will usually provide a suitable seed-bed.

Place in Rotation

Like most other root crops, sugar beet does best after grass, but good crops can also be obtained when following swedes or chou moellier that have been fed off, or peas and red clover, on account of the nitrogen which they have added to the soil.

Successive crops may be grown on the same land where the natural fertility is high, or where heavy-yielding crops have previously been obtained.

Time of Sowing

The sugar content, varying from 14 to 20 per cent., is directly controlled by the type of soil, variety, climatic conditions, and earliness of sowing. Best results are generally obtained by sowing in October, preferably at the beginning of the month, when the land is usually moist from the winter rains and good growth is obtained before drier conditions prevail. Late sowings usually result in poor crops with a correspondingly lower sugar content and reduced feeding value.

Rate of Seeding

The usual seeding rate is 4 to 5lb. of seed per acre, but where the seed-bed has been well prepared and ample moisture is present 3 to 4lb. per acre has proved satisfactory. The "seed" closely resembles that of mangolds but is slightly smaller. Each seed case contains from 2 to 5 seeds, most of which are capable of germination.

No seed treatment for disease or germination is necessary.

Method of Sowing

The seed may be sown with the combined ridger and sower or with the grain drill on the flat. Each system has advantages, but the latter is probably the more commonly used. The rows should be 18in. to 21in. apart to allow for intercultivation and the

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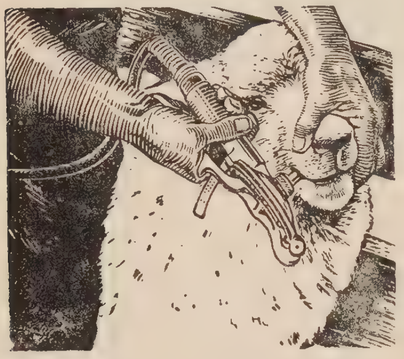

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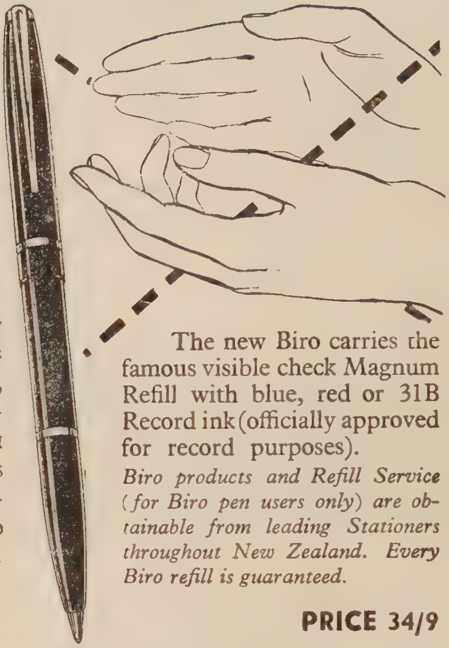

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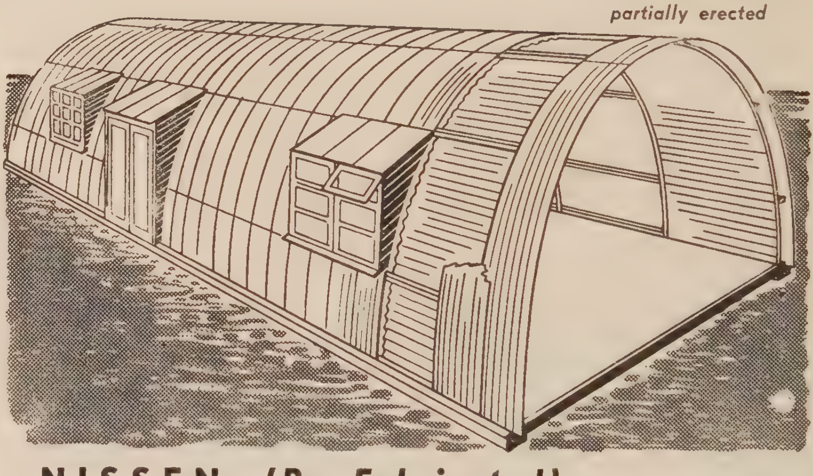

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seed sown from ½in. to 1in. deep. Rolling after drilling is advisable.

This crop also transplants well in the North Island, especially in the Auckland and Taranaki districts, and for very small areas this method is satisfactory, leaving a longer period for the preparation of the ground and the killing of weed seedlings. Care must be taken, however, to see that the tap root is neither broken when lifting nor doubled up when planting. The transplants may be put in with a trowel or laid along a furrow slice and ploughed in, but with this latter method the earth is often insufficiently firmed against the roots and some plants die.

Manuring and Cultivation

A sweet soil is essential for a good sugar content, and from 5cwt. to 10cwt. of carbonate of lime should be applied after ploughing. On naturally fertile fields, 4cwt. of serpentine superphosphate has proved satisfactory, but the addition of 2cwt. of blood and bone and 1cwt. of sulphate of ammonia is recommended.

In those districts where potash gives a response on pasture or mangolds 50lb. of muriate of potash should be added to the mixture.

On dairy farms where liquid manuring is carried out one aplication before ploughing, followed by another application after germination, together with the artificial manure applied at sowing time, gives the best results. On a trial carried out on the Stratford Demonstration Farm the above system proved better than any other. When only the solid portion of the animal manure is used it should be spread over the area to be cropped before ploughing. Sugar beet requires fertile conditions and is an excellent crop to grow in worn-out pig runs or other areas that have received a heavy concentration of animal manure.

Hand weeding or hoeing soon after germination is necessary for weed control, and at the same time plants should be thinned to about 9in. apart. Horse hoeing or mechanical intercultivation should be carried out between the rows, but the meeting of the vigorous growing tops soon renders further intercultivation unnecessary, even in wet seasons when weed growth is prolific.

Small areas well cared for are better than larger areas given little attention.

Unlike mangolds sugar beet can be fed with perfect safety during all stages of growth, and storing for increased digestibility is unnecessary. The roots may be left in the ground and dug as required, but if grown for use during October and November they should be lifted in July, after the tops have died down, and stored in heaps in a dry place, covered with straw or hay to exclude light to prevent new growths from the crowns.

VALUE OF SUGAR BEET AS A CROP

Good specimens of sugar beet plants.

Sugar beet is usually grown in small areas, and so far has not warranted the manufacture of special machinery for harvesting. Crops are usually lifted with a digging fork or spade, while a deep furrow is sometimes ploughed alongside a row and the roots pulled over by hand.

Tractor-drawn potato diggers set as deep as possible have been used successfully for lifting sugar beet, but in most cases the tips of the roots are broken off. A home-made lifter which obviates this fault may be made by attaching a shovel-shaped blade to the beam of a single-furrow plough in place of the mouldboard and share (see illustration on the next page), the plate being 18in. wide, 15in. deep, and sharpened on the front edges. Drawn by a small tractor with a man holding the handles of the lifter, this implement effectively lifts the beets and leaves them ready for carting off.

Sugar beet is not attacked by insects. Mottled heart and crown rot are sometimes found in the roots, but occurrence of these diseases is usually not sufficient to warrant any other treatment than selecting a new area for each year's crop.

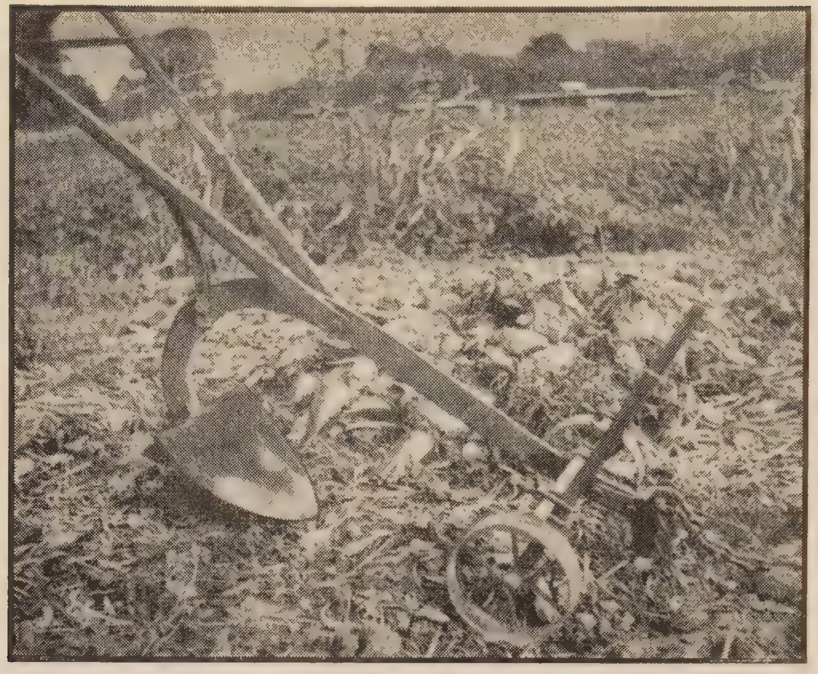
Utilisation

Although primarily grown for feeding pigs during the winter and early spring when dairy by-products are in short supply, sugar beet provides a food supply from March to September or October. Having only a small stomach capacity, pigs are unable to assimilate sufficient of the more bulky foods to obtain an adequate ration, but the high dry-matter content of sugar beet overcomes this difficulty. Analysis of commonly grown pig foods in the table on this page shows that sugar beet contains considerably more actual food than the other crops. An animal has to eat almost double the quantity of both mangolds and pumpkins to obtain the same nutriment as from sugar beet. The high value of the leaves allows their profitable

ANALYSIS OF SUGAR BEET COMPARED WITH OTHER ROOT CROPS

Crop	Water per cent.	Ash per cent.	Protein per cent.	Carbohydrates per cent.	Fat per cent.	Dry Matter per cent.
Sugar beet leaves ..	88.4	1.8	1.9	7.6	.3	11.6
Sugar beet roots ..	83.6	1.1	1.2	12.6	.1	16.4
Carrots	88.3	1.2	1.2	9.1	.2	11.7
Pumpkins	91.7	.9	1.4	5.5	.5	8.3
Mangolds	90.6	1.0	1.4	6.9	.1	9.4

VALUE OF SUGAR BEET AS A CROP



A home-made lifter which effectively lifts the beets and leaves them ready for carting off.

utilisation during the early autumn, when they can be fed to sows and litters as the milk supply dwindles.

For feeding to poultry the beets should be split lengthways and stuck on nails on the wall of the fowlhouse, about 18in. from the floor, where the fowls can pick at the roots without fouling them by tramping and where they will be sheltered from wet weather.

Sugar beet can be fed to dairy cows in the same way as mangolds, but is not usually grown specially for this type of stock, which can efficiently use the more bulky roots. Stall-fed cattle for winter milk supply, however, produce better on sugar beet than on mangolds.

Small areas of sugar beet have been grown for feeding sheep, when the crop is made to serve a double purpose. During the autumn store lambs are allowed to graze the tops, and fatten equally as well as when fed on rape; later the roots are lifted and fed out on grass to mature sheep. This method of utilisation is not generally adopted, and is more suited to those localities where club root or insect pests prevent the growing of cruciferous crops.

Sugar beet is grown almost exclusively for pigs and can be fed, at any stage of growth, to animals of any age from suckers to breeding stock. During April and May the tops form the bulk of the crop, and the sugar content of the roots is also high. Feeding out usually commences about this time; a portion of the crop is fed to sows and litters to supplement the dwindling milk supply, thus introducing weaners to this food before weaning. After weaning, sugar beet forms the main portion of the ration, supplemented by milk and meat meal. When the milk supply ceases, sugar beet to capacity **plus ½lb. meat meal per day** will profitably winter these stores and allow them to make daily gains in weight of up to 1lb.

Where the area is suitably fenced and warm, draught-proof accommodation provided, stores may be grazed on the crop, when no harvesting or feeding out is necessary. Meat meal, however, should be supplied to the grazing animals to secure the best results. This method may appear wasteful, but the saving in labour somewhat compensates for this.

For ideal utilisation sugar beet should be fed to the pigs on grass. Some farmers have adopted the method of cropping part of a paddock, and feeding out on the balance of the field, which is made pig proof. Each year the cropped portion is regrassed and a new area broken up for the crop. Temporary sleeping quarters for the winter are provided and should be substantial enough to serve until the whole of the field has been cropped. By this method the pigs have an area of young grass each year, and the fertility of the balance of the field is increased by having the crop fed on it, and this in turn assists in the production of the following crop.

This type of utilisation has enabled large numbers of store pigs to be wintered and even fattened with a minimum of losses, and at the same time allows some rejuvenation of the pasture in the permanent pig runs. The provision of a winter supply of roots, grown and utilised on another portion of the farm, is therefore well worth while.

Sugar beet is the most suitable crop for pigs and will produce more feed per acre than any other crop.

FRAMES FOR CHINESE GOOSEBERRY VINES

YIELDS of Chinese gooseberries are influenced largely by the cultural treatment the vines receive, and for satisfactory results many growers have found that building a suitable type of framework on which to train the plants requires careful thought and planning. In districts where this fruit is produced commercially several methods of training have been adopted, and in this article F. L. Bailey, Orchard Instructor, Department of Agriculture, Tauranga, describes types of framework constructed in orchards in the Tauranga district which are permanent, strong, and neat. The general culture of the vines was detailed in an article on page 223 of last month's "Journal."

[*Rendell's Photo Service photo.*

THE Chinese gooseberry plant (*Actinidia chinensis*), a vigorous twining vine, will assume large proportions if allowed to grow unchecked on fertile soil. The rate of growth and vigour of the vine are remarkable compared with those of other vines cultivated in New Zealand. Each year the extraordinary vigour of the growth calls for intelligent training and management if satisfactory crops of fruit are to be harvested. If growth is unchecked and the training of the vines neglected, a tangled mass of vegetation will result. That is undesirable, for if it is allowed to persist, convenient handling of the vines becomes impossible, valuable space on the holding is often lost, production usually is reduced to a low yield of poor-quality fruit, and adequate spraying is made exceedingly difficult.

For successful and economic production a trellis or framework on which to train the vines is necessary, as with grapes and passion fruit, but for Chinese gooseberries the structure must be much stronger and therefore is more expensive.

The object of trellising is to make the vines conform to an ordered shape, designed to promote fruitfulness and to facilitate cultivation, harvesting, and spraying. As the structure must bear a great weight when the vines are fully grown, materials used in construction should be durable and capable of withstanding heavy strain. Prospective growers would be well advised to build to a plan prepared according to the manner in which it is intended to train the vines. The framework should be erected either before the vines are planted or as soon afterward as possible. If construction is left too long, the shaping and training of the young plants usually is neglected, to the future detriment of the vines.

Two Types of Framework

Usually Chinese gooseberries are grown on fences or pergolas. Both kinds of framework have their advantages, and the choice depends largely on the grower's views. Some fruit growers have planted Chinese gooseberry vines without support as a sideline in orchards, and in such cases it has been necessary to confine the growth to a narrow hedge which will not interfere with the cultivation of the fruit trees. In many instances the use of a fence for training the vines would prove more satisfactory. The fence trellis is preferred by most commercial growers because vines growing on it are easier to manage and costs of construction usually are much less than for the pergola type. Fences of many different heights and varying numbers of wires are used. Some have given satisfactory results but others leave a good deal to be desired.

The illustrations with this article show pergola and double-fence types of framework for training Chinese gooseberry plants constructed by fruit growers in the Tauranga district. All have been built solidly and have proved very satisfactory for the training and management of the vines.

Double-fence Framework

A trellis which is proving very satisfactory for crop yields and ease of management is the double-fence framework. Two parallel fences are erected about 4ft. apart. Reinforced concrete strainers and intermediate posts are preferable to wood; the higher cost is repaid eventually by much longer service. If wooden posts must be used the bases should be treated with creosote to preserve the timber underground. The fences should run as nearly north and south as possible so that the vines may obtain the maximum benefits from sunshine.

The posts should be 8 to 9ft. long to allow for 2 to 3ft. in the ground and 6ft. above. At the ends of each fence should be a good strainer post stayed in position in the normal way. Intermediate posts should be about 25ft. apart in each fence. If concrete posts are used, 6in. x 6in. strainers and 4in. x 4in. intermediate posts reinforced with ⅜in. or ¼in. reinforcing rods are quite satisfactory.

Three No. 8-gauge wires should be spaced evenly on each fence with the highest strained along the tops of the posts and the lowest 2ft. above the ground. One wire should be run lengthwise along the centre of the top of the structure, supported by 4in. x 2in. cross-beams or by wires bound across at the top of each pair of posts. The wires form a framework on which the vines may be trained.

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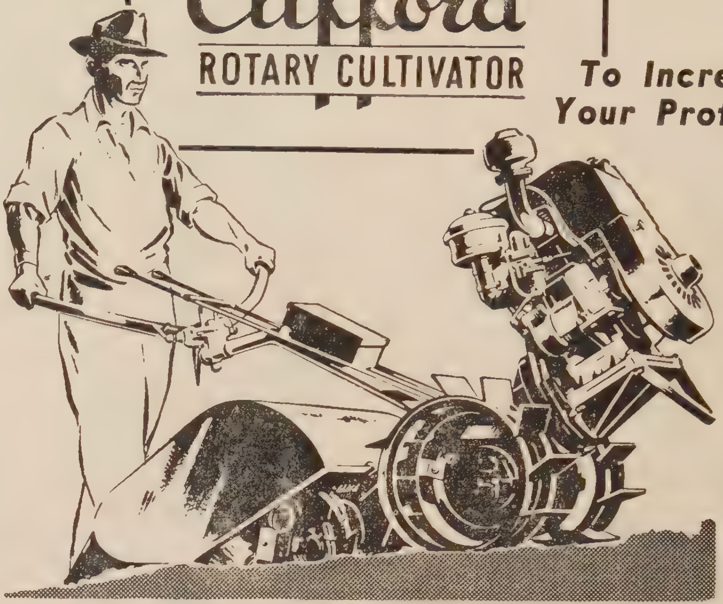

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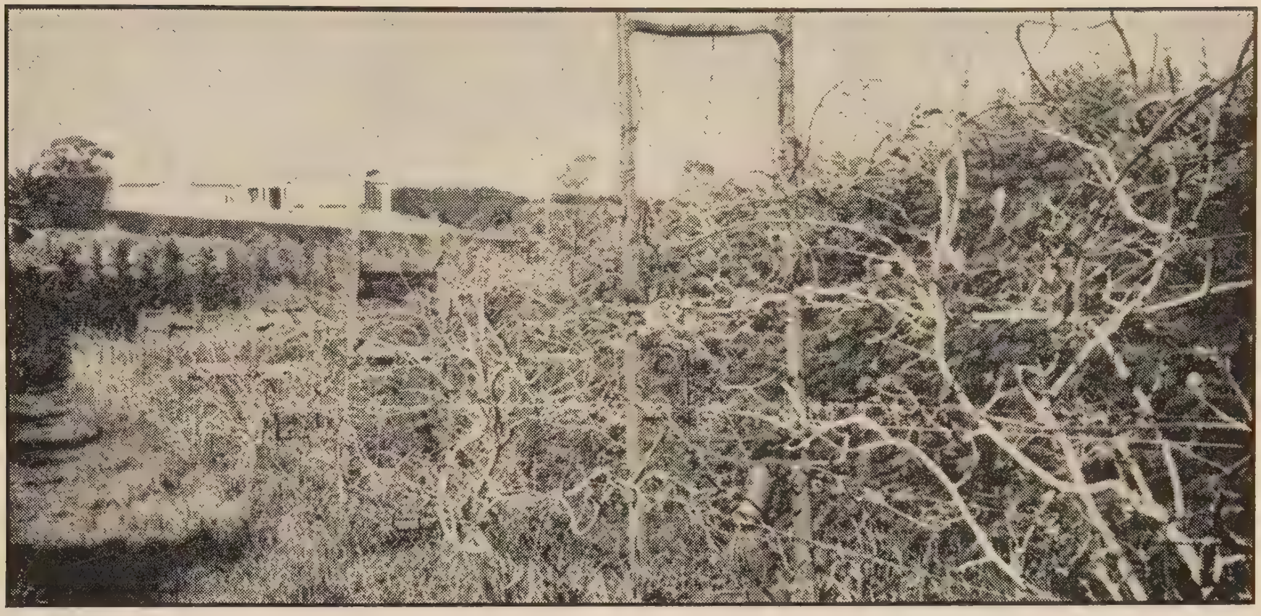
FRAMES FOR CHINESE GOOSEBERRY VINES



The illustrations on this page show a framework in which old motor vehicle chassis have been used as supports. The chassis are about 2ft. 6in. wide, eight supports being used for each 50yds of frame. The supports at each end are stayed with heavy timber in the same manner as fencing-post strainers. Three No. 8-gauge wires are affixed to each side of the supports, the first pair 3ft. above the ground with 18in. intervals between the remaining two pairs. A single wire supported by wires bound across each chassis runs through the centre of the structure about 7ft. 6in. above the ground. The wires provide the framework to which the main rods of the vines are attached and trained.

The structure described is simple to erect and not costly. The motor chassis were bought for £1 5s. each, and the cost of the materials, including wire, was about £14 for 50 yds. To give a true picture of the over-all cost, labour involved in building the structure would need to be added, and the use of such material for supports is limited by the supplies available. Metal supports have the advantages of being strong, durable, and much less subject to deterioration than wood.

The vines in the illustrations were planted in 1942, and in 1949 the yield averaged 250lb. of fruit per vine. The double-fence framework makes training the vines and harvesting the fruit simple and greatly facilitates pruning and spraying.

Flat-topped Pergola

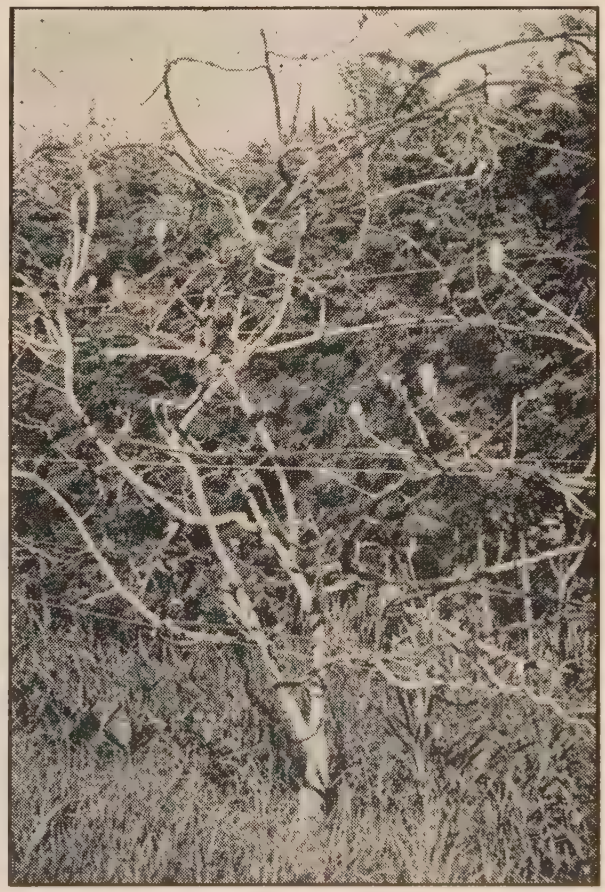
In most cases an overhead pergola is more costly to build than a fence trellis and, because of its shape, training and pruning of the vines are sometimes more difficult.

The importance of using solid materials in the construction of a pergola cannot be emphasised too strongly. Using light materials or trying to economise on materials is unwise, as a flimsy structure is likely to sag or collapse under the strain.

The usual type of pergola built is flat topped. Heavy cross-beams of timber or metal are erected on posts and the structure is wired overhead at intervals of 2 to 3ft. to provide a canopy on which to train the vines. The vines are planted 15 to 20ft. apart in rows along the centre of the pergola and are trained horizontally over the canopy. Structures vary in width but usually are between 20 and 30ft. wide. There is no standard type of pergola for Chinese gooseberry vines, but in the Tauranga district several have been erected with light-gauge railway lines or old motor vehicle chassis for cross-beams.

[Rendell's Photo Service photos.

Two views of a double-fence framework in which old motor vehicle chassis were used as supports, photographed during the dormant period of the vines.



AN ARCHED PERGOLA FOR CHINESE GOOSEBERRY VINES

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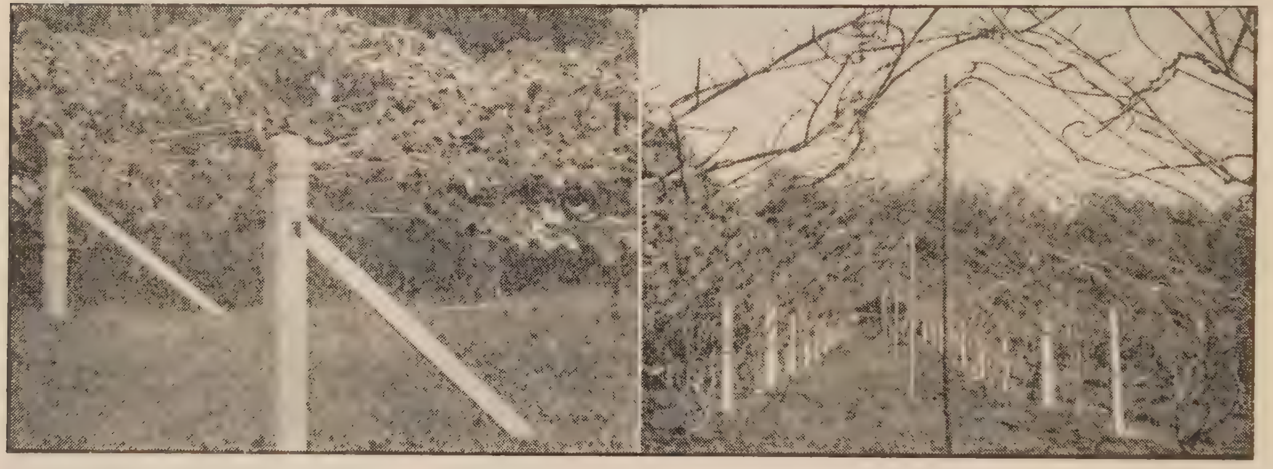
An arched pergola as it appears during the growing and dormant periods of the vines.



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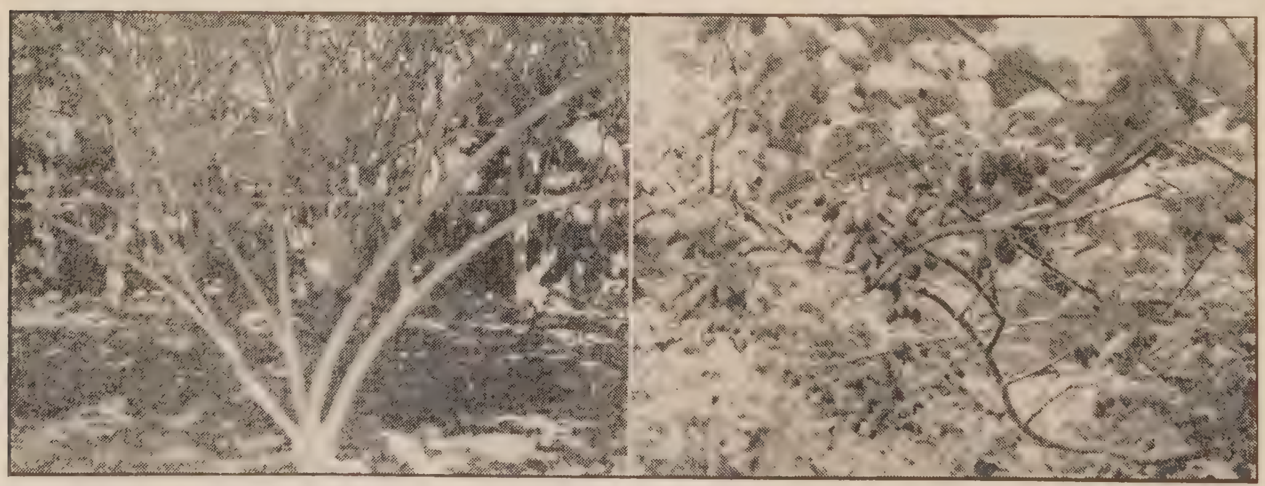
The method of supporting and staying the structure. The heavy centre pole is 12ft. in from the end.



[Rendell's Photo Service photos.

The fan-like system of training the vines and part of the resultant crop ready for harvesting.

FRAMES FOR CHINESE GOOSEBERRY VINES

[*Rendell's Photo Service photo.*

An end view of a flat-topped pergola in which light-gauge rails were used for cross-beams.

A flat-topped pergola should be not less than 6ft. high. If it is lower, the grower of average height must stoop unduly when pruning, harvesting, or spraying, which makes the work more arduous. In the Tauranga district mature vines growing on a flat-topped pergola 20ft. wide have been known to average 400lb. of fruit each. One vine growing on the same pergola yielded 10cwt. of fruit in 1948.

Ridged Pergola

The ridged or arched pergola illustrated is more costly to build than a flat-topped pergola, but the design provides more headroom and makes management of the vines easier. Principal measurements are: Length 75yds., width 15ft., height at sides 4ft. 6in., and height at centre 8ft. 6in.

Materials used to build the structure were 6 concrete strainers, 6in. x 6in. x 8ft.; 4 concrete stays for strainers; 4 concrete feet for stays; 24 tapered concrete standard posts, 4in. x 4in. x 6ft.; 4 heavy tubular pipes, 4in. in diameter and 9ft. long; 2½cwt. of No. 8-gauge wire; concrete and shingle (cost estimated at £7).

With the exception of the tubular pipes used for the centre poles in the structure, all the materials were new. The piping was second hand and, though well suited for the purpose, could be replaced quite successfully with other durable material such as old angle iron or used tramway or railway lines. The cost of the materials, excluding the piping, was about £33.

Details of Construction

Three concrete strainer posts were used for each fence, one at each end and one in the centre. The strainers are encased in concrete to a depth of about 2ft. 6in. and stayed with concrete struts. Intermediate concrete posts of the standard tapered type are 15ft. apart and for added stability are set in concrete to a depth of about 2ft.

One of the heavy 4in. centre poles was placed 12ft. in from each end and midway between the side fences. The other two 4in. poles were erected at intervals of 67ft. between the end poles. The lighter 2in. poles were erected at equal distances between the heavier poles at the rate of two light poles to each heavy one. The 4in. poles are encased in concrete to a depth of 2ft. 6in. and the lighter poles are set on concrete blocks, the foot of each pole entering the block to a depth of about 2in.

The poles at each end of the structure are stayed with a double set of heavy guy wires attached to the top of each pole and strained to the tops of the strainer posts.

Wiring the Structure

Three No. 8-gauge wires to each side fence, the first 2ft. above the ground, and with 15in. intervals between them, furnish those sections of the structure. The wires are strained as taut as possible so that the overhead wiring, which is attached to the top wires of the side fences, may be completely rigid.

A single heavy-gauge wire runs through holes drilled near the tops of the centre poles to form a ridge. At intervals of 7ft. 6in. wires pass from the top wire of one side fence over the ridge to the other. To complete the framework two parallel wires were run down the length of the pergola on each side of the ridge and fixed in position so that all lengthwise wires on the canopy are about 2ft. 6in. apart. For tautness and rigidity the ends of these wires are bound to the strainer posts. Where lengthwise and crosswise wires intersect they are kept in position by bindings of light-gauge wire.

The vines were planted 15ft. apart midway between the posts in the side fences and have been trained on a fan-like system to take full advantage of the framework on the sides of the structure. Overhead the rods of the vines have been trained so that the canopy is fully covered. Summer pruning is carried out where necessary to prevent the vines becoming overcrowded and allow the free admission of air and sunlight to assist fruit development. When mature the fruit hangs in a convenient position for harvesting. Picking of the fruit is rapid, as the worker is able to stand in a natural position and much of the stooping and back aches often associated with harvesting Chinese gooseberries growing on low and poorly designed framework is avoided.

Suggested Improvements

The following modifications are suggested as improvements which would add little to the cost of the structure:—

The pergola could be increased in width from 15ft. to 25ft.

The height of the centre of the structure could be reduced from 8ft. 6in. to 7ft. by using shorter centre poles.

The side fences could be raised in height from 4ft. 6in. to 5ft. 6in.

The area over which the vines could be trained would be increased, and raising the height of the side fences and lowering the height of the centre poles would reduce the pitch of the pergola considerably. Both factors would be likely to increase crop production.

The modifications would involve the use of slightly longer posts for the side fences and additional No. 8-gauge wire to cover the larger area. That would add a little to the costs of the materials previously given.

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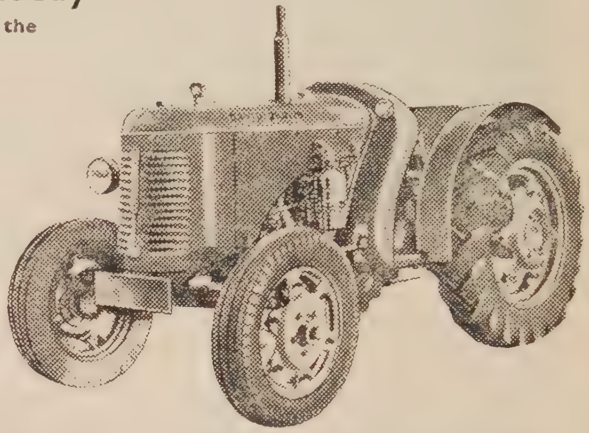

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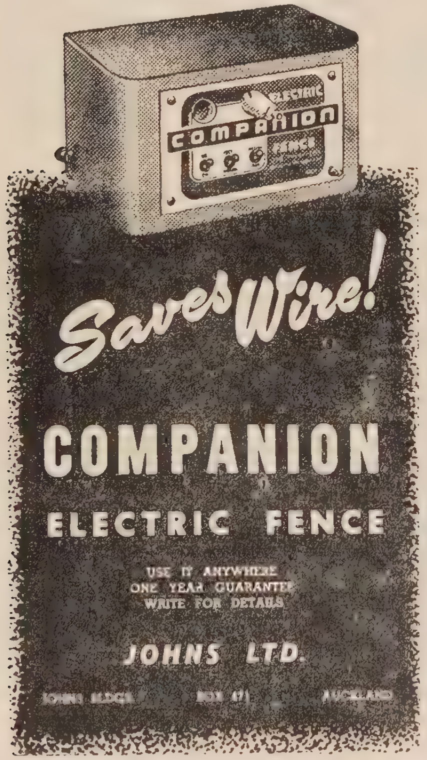
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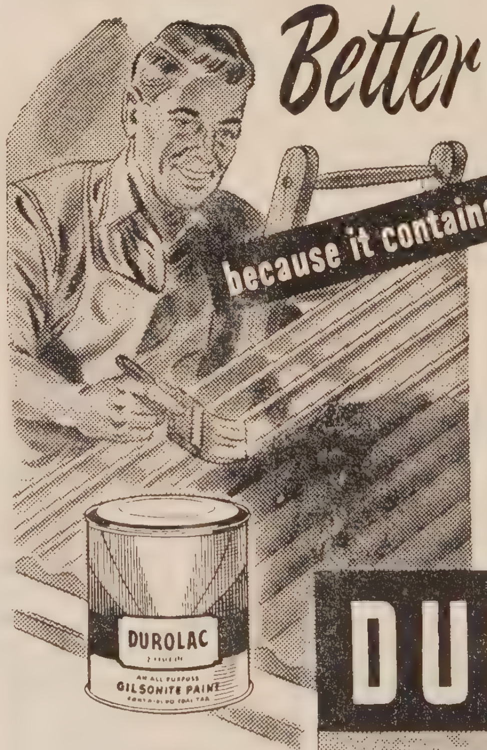
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FARMING IN NEW ZEALAND

Rangiora and Eyre Counties

By P. VAN PRAAGH, formerly of the Extension Division, Department of Agriculture, Christchurch.

BETWEEN the Waimakariri and the Ashley Rivers lies an area—Rangiora and Eyre Counties—remarkable for its diversity of farming, types of land ranging from that capable of carrying only a few store sheep to high-producing dairy land comparable with the best in the higher-rainfall areas in the North Island. In general the area presents a well-ordered pattern of farming with lighter land to the western and southern boundaries and land with increased carrying capacity and productivity further eastward toward the coast. Farms in Rangiora and Eyre Counties are well cared for and prosperous, being bounded by the neat gorse hedges so common to the Canterbury Plains and watered by a reticulation scheme maintained partly by the county councils and partly by the farmers. Land values range from a matter of shillings per acre for lighter land to figures in the vicinity of £70 to £90 an acre for heavier land and the size of holdings varies inversely to land values.

BESIDES farming, other industries such as freezing works at Kaiapoi, two flourmills at Rangiora and one at Wetheral, and a twine works and wool-scouring plant at Waikuku all help to maintain the economic structure of the counties at a high level. The development of local industries such as the Kaiapoi Woollen Mills, while not directly affecting farming in the counties, indirectly benefits the farmer by providing local markets for eggs and meat.

Rangiora and Eyre Counties, with a total occupied area of 148,551 acres, are bounded in the north by the Ashley River, in the south by the Waimakariri River, to the east by the sea, and to the west by Wolffs and Bennetts Roads. A feature of the district is the large area covered by the beds of the Waimakariri, Ashley, and Eyre Rivers. This has a considerable bearing on the farming economy, especially as the shingle beds deposited by the rivers during the formation of the Canterbury Plains form the natural causeway of the underground water which affects this area. The boundary between the two counties stretches in an approximately straight line from Bennetts to just north of Kaiapoi township. The area is well served by road and rail, there being three railway lines which traverse the area in such a way that all parts are convenient to the railway. This, together with the good roads, allows the rapid movement of stock and quick marketing of farm produce so essential to the farmer.

Climate

Rangiora and Eyre Counties experience a normal Canterbury Plains type of climate, most suitable for a mixed arable type of farming, and lie in the 25 to 30in. rainfall belt.

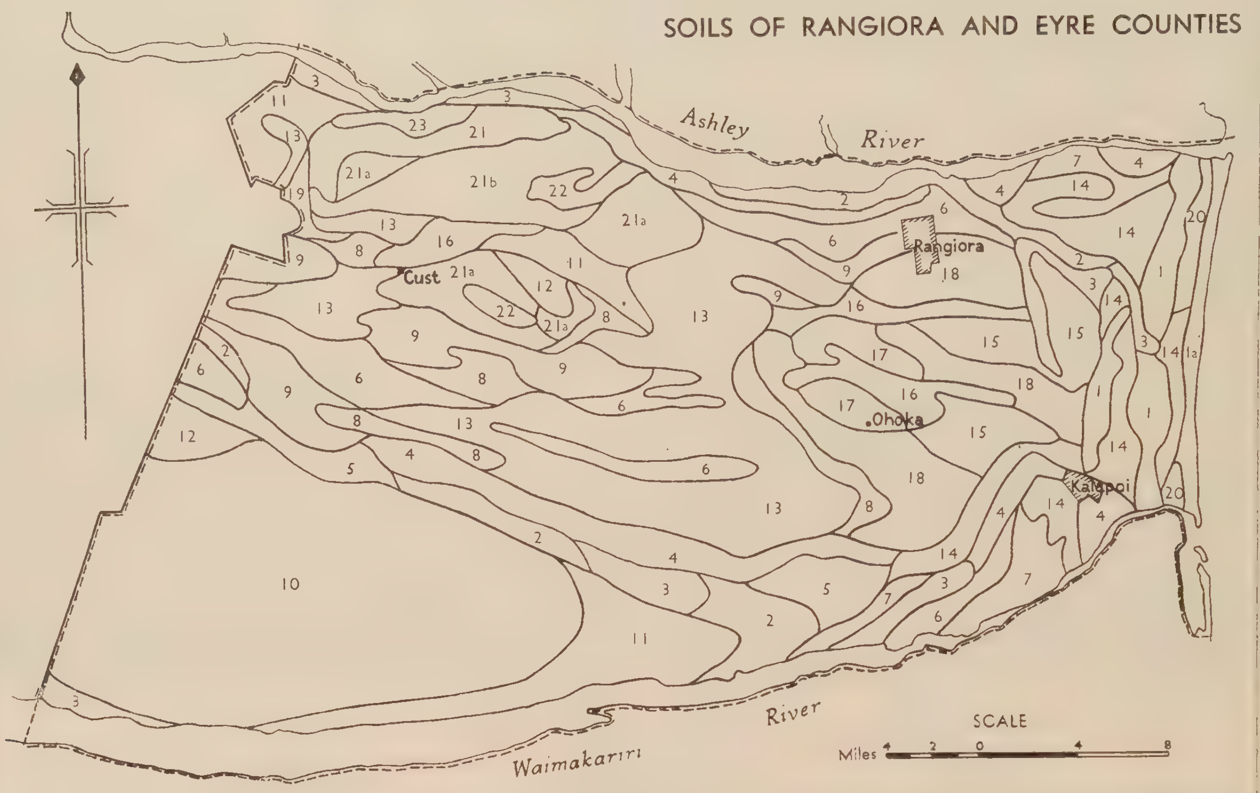
TABLE 1—AVERAGE DISTRIBUTION OF RAINFALL IN RANGIORA, 1918-1939.

Month	Rainfall in.
January	2.72
February	2.02
March	1.50
April	1.83
May	2.07
June	2.13
July	2.39
August	2.04
September	2.27
October	2.08
November	2.10
December	2.45
Total	25.60

Table 1 indicates a fairly even distribution of rainfall, except during February, March, and April, when the average is lower. This is typical of all the Canterbury Plains and affords ideal conditions for the ripening of grain crops. There is also a danger of drought during these months.

The average annual rainfall of 25.60 in. is too low for the maintenance of truly permanent pastures and is thus a factor necessitating a mixed arable type of farming, except near the coast. Here the high water-table and the moisture-retaining nature of the soil enable maintenance of more permanent pastures. The rainfall increases further inland nearer the foothills in the west, where there is a section commonly known as the north-west shower belt.

Heading photograph by V. C. Browne.



SOILS OF RANGIORA AND EYRE COUNTIES

[*Map drawn by Head Office, Department of Lands and Survey, Wellington.*

Recent and Recent-to-young Soils (Alluvial and Littoral)

Droughty to well drained

1. Kairaki complex.
1a. Kairaki complex, unconsolidated.
2. Waimakariri and Paparua shallow stony loams.
3. Waimakariri and Paparua shallow sandy loams.
4. Waimakariri and Paparua sandy loams.

With better supply of moisture

5. Waimakariri and Templeton shallow silt loams.
6. Waimakariri and Templeton silt loams and silt loams on sandy loams.
7. Kaiapoi silt loams.
8. Springston and Papanui shallow silt loams and shallow sandy loams.
9. Springston silt loams and silt loams on clay loams.

Young-to-immature and Immature Soils (Alluvial)

10. Lismore shallow stony silt loams.
11. Eyre shallow stony silt loams and shallow bouldery loams.
12. Lismore shallow silt loams.
13. Eyre shallow silt loams.

Grey Soils (Alluvial)

14. Tai Tapu silt loams, etc.
15. Temuka silt loams.
16. Temuka shallow silt loams.
17. Temuka peaty silt loams and very peaty silt loams.
18. Temuka silt loams on clay loams.
19. Temuka swamp complex.

Saline Soils (Alluvial and Marine)

20. Motukarara weakly saline silt loams.

Soils of the Downs

21. Mairaki silt loam.
21a. Mairaki silt loam, easy rolling phase.
21b. Mairaki silt loam, undulating phase.
22. Mairaki strongly mottled silt loam.
23. Taiko hill complex.

TABLE 2—RAINFALL IN AREAS SURROUNDING RANGIORA AND EYRE COUNTIES

	Rainfall in.	No. of days of rain
Amberley	27.32	106
Oxford	40.33	107
Christchurch	26.10	126

The rainfall station at Oxford is in the north-west shower belt and the tables show the extent to which rainfall increases as this region along the foothills is approached. The wide variation of the rainfall from year to year adds yet another hazard with which the farmer must contend.

Winds: Hot, drying north-west winds experienced in late summer assist in providing excellent harvest weather. Strong north-westerlies may sometimes reach gale force and are a hindrance in harvesting clover and grass seed. The north-easterly winds, which are colder and may bring rain, have the effect of balancing the north-westerlies to some extent.

Southerly winds, occurring mainly in winter, are the main rain-carrying winds in the district.

Frost, hail, and snow: In the past 5 years at the Eyrewell Plantation there was an average of 100 frosts a year, temperatures as low as 22 degrees F. occurring during July. These heavy frosts tend to halt growth over the winter.

Snow is never very heavy in the area, although it did lie in places to a depth of 2ft. in July, 1945. Generally, no more than a few light falls are experienced and, as they seldom lie on the ground for long, snow presents no problem to winter feeding of stock.

Hail, on the other hand, is an important climatic factor in the district, particularly in certain areas lying in fairly well-defined hail belts. The hail storms are often of sufficient force to flatten crops and there is a risk of crop destruction from hail throughout the growing and harvesting season.

Sunshine: The hours of sunshine in the district are generally high, except near the coast, where the ground is lower lying and coastal fogs sometimes cause overcast conditions. This has the effect of shortening the working day, particularly during the harvesting season.

In general the climate is fairly equable. The main hazards are frosts and the tendency to drought on the land further in from the coast. This necessitates provision of supplementary winter, autumn, and early spring fodder crops. The north-west winds, although at times a handicap, facilitate the ripening and harvesting of cash crops.

The map on the opposite page gives a generalised picture of part of a more detailed soil map of the whole of the Canterbury Plains and downland. In Rangiora and Eyre Counties 42 soil types were mapped, but in the map shown these have been reduced to 23 types and 2 phases. Soil type names have been chosen from those areas on the plains and downs where the types occur most extensively. It must be understood that these soil types do not necessarily indicate specific types of farming, but rather classify the natural state of the soils without wholly taking into consideration artificial changes resulting from draining, liming, and fertilising.

About 85 per cent. of the two counties consists of flat, alluvial, greywacke gravels, sands, and silts of the overlapping fans of the Waimakariri and Ashley Rivers. Downland made up of older greywacke alluvium covered by wind-blown dusts mainly from the Ashley River comprises the remaining 15 per cent. In the case of the alluvial soils (types 2 to 20) fertility depends mainly on depth of soil to stones and texture of topsoil and subsoil, these factors in turn accounting for the amount of moisture retained. Another important factor which affects fertility is the amount of leaching that has taken place. Soils highest above the rivers (Lismore and Eyre series) are the most leached, while those at lower levels and closer to the rivers are very recent in origin and are therefore relatively unleached (types 2 to 9 and 14).

1. Kairaki complex is made up of coastal sand dunes moderately well anchored by dune vegetation, pasture, or pine trees. Among the dunes are flat, sandy areas and hollows containing silts from the Ashley and Waimakariri Rivers.

1a. Kairaki complex unconsolidated is the seaward margin of the dunes, held in places by scattered vegetation, but for the most part freely eroding.

Groups 1 and 1a are mostly used in conjunction with groups 14 and 20 for dairying or fattening of livestock. A typical pasture has as its main constituent strawberry clover, which provides a good sward and a bulk of feed adequate for dairy cows.

2. Waimakariri and Paparua shallow stony loams, averaging about 6in. in depth of topsoil and subsoil, are very droughty.

3. Waimakariri and Paparua shallow sandy loams average about 15in. of topsoil and subsoil. Though droughty, they do not dry out quite so quickly as the foregoing types.

4. Waimakariri and Paparua sandy loams average more than 18in. of topsoil and subsoil, so that their moisture-holding capacity is better than that of type 3.

5 and 6. Waimakariri and Templeton shallow silt loams, because of their heavier texture, retain moisture better than sandy soils of the same depth. Waimakariri silt loams and silt loams on sandy loams are greater than 18in. in depth to the underlying stones, so that they suffer much less in dry weather.

7. Kaiapoi silt loams are in most places 36in. or more in depth and their supply of moisture in most seasons is adequate.

8 and 9. Springston and Papanui shallow silt and shallow sandy loams are 15in. or more in depth. They are situated at lower levels than surrounding dry types and therefore receive sufficient moisture by seepage through the underlying gravels to carry pastures through periods of low rainfall. In winter surface water sometimes accumulates.

With good management types 6, 7, 8, and 9 should be capable of maintaining permanent pastures.

10, 11, 12, and 13. Lismore and Eyre soils are moderately leached of plant foods and chemically the initial lime requirement is about 2 tons per acre. Lismore and Eyre shallow stony silt loams (10 and 11) average 7 to 8in. in depth and droughts are severe. Lismore and Eyre shallow silt loams (12 and 13), averaging 15in. in depth, retain moisture better. Of these last two Eyre shallow silt loam, being somewhat less leached, is the more fertile.

14, 15, 16, 17, 18, and 19. Tai Tapu and Temuka soils are low lying and badly in need of drainage. They occupy what was formerly known as Rangiora Swamp, from which escape of water to the sea is largely prevented by the barrier of coastal dunes. Tai Tapu silt loams (14) are very fertile soils capable of supporting permanent pastures, but Temuka soils (15 to 19) which are more leached, require phosphate and lime to maintain a good permanent sward.

20. Motukarara weakly saline silt loams consist of a damp stretch, parallel to the sea, of low-lying alluvium immediately inland of the unconsolidated coastal dunes. Drainage would prove difficult and if successful the next problem would be the removal of salt.

21, 21a, 21b, and 22. Mairaki series, consisting of silt loams on heavy silt loams to clay loams, is broken up topographically into flat (strongly mottled), undulating, easy rolling, and rolling land. The flat and easy undulating types are wet in winter and give some trouble in cultivation. All types chemically are leached and show a lime requirement of up to 3 tons per acre in the first year of application.

On types 21, 21a, and 21b overcropping, accompanied by ploughing up and down the slope, has led to loss of topsoil by erosion and this loss, though probably less marked, can be seen clearly going on today.

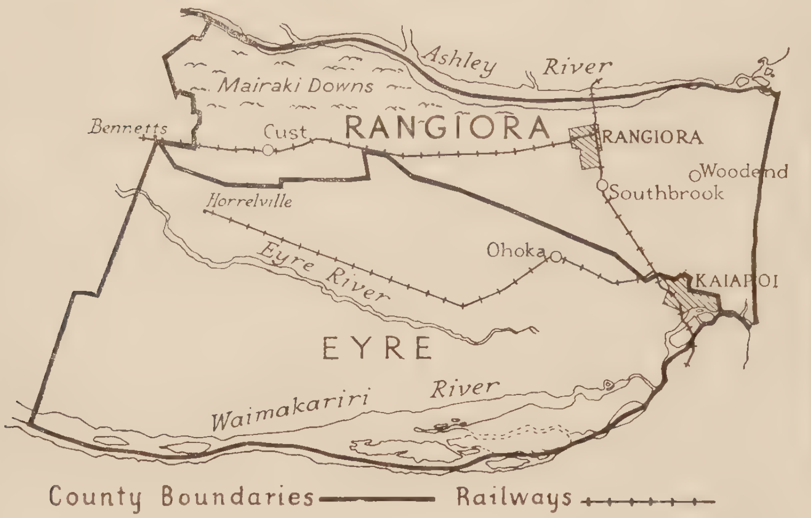
23. Taiko Hill complex is moderately steep and has eroded strongly in the past. Profiles are very variable.

Types 1, 1a, 2, 3, 4, 10, 11, 12, 13, and 21 to 23 topsoils are low in humus content. Most paddocks on types 21 to 23 have lost topsoil by sheet erosion, and wind has removed several inches in places from cultivated paddocks on types 2 to 4 and 10 to 13. These wind-eroded spots are sometimes referred to by local farmers as "starvation paddocks."

Part of Eyrewell State forest. Green and Hahn Ltd. photo.

FARMING IN RANGIORA AND EYRE COUNTIES

MAIN TOWNS AND RAILWAYS IN RANGIORA AND EYRE COUNTIES



[Map drawn by Head Office, Department of Lands and Survey, Wellington.

Underground Water (Undercurrent)

The farm management in this area is so intimately connected with drainage problems and the seepage of underground water that it is essential to study the effects of the high water-table on farming. In the area of Flaxton, Ohoka, and Camside the level of the water-table was formerly coincident with the surface, but, owing to draining, the level was lowered considerably. In the past few years, owing to various factors, the water-table has again risen and is now affecting farming practices over a large area.

It has been ascertained from research by the Geological Survey, Department of Scientific and Industrial Research, and discussion with local inhabitants that the water-table is affected by a slow-moving undercurrent of water. The origin and control of the undercurrent are a matter of much conjecture among local and scientific investigators. It appears to have an association with rainfall and is similarly associated with levels of nearby rivers. The undercurrent has been known to rise above the surface of the ground without any corresponding change in the level of rivers. A common theory also is that there is underground seepage from the higher Oxford territory, with a definite time lag between heavy rainfall near Oxford and the effects of undercurrent at Horrelville and lower down the plains.

The moving undercurrent travels in beds of shingle and is apparent for long only on Tai Tapu and Temuka soils (14 to 19 inclusive on the map on page 354). Here water rises to the surface, forming small swamps, retarding growth, and leaving the land in such a condition that a lapse of up to 12 months is required to restore its natural fertility. It is common in this area to hear of excellent crops of wheat, etc., just ready to be harvested, being swamped by the rising water-table.

The unsatisfactory drainage system as it exists today may be attributed to the following:—

1. The deterioration of the present drainage system due to neglect in clearing away silt, weeds, and the overgrowth of willows. The protection of drains from stock is also essential and does not appear to have been given proper consideration in the past.

2. The building up of riverbeds, which raises the water levels of both the river and the water-table when the two are related. A good example of this is afforded by the land just north of Wilson's siding. Some years ago, before the main drain had built up its own bed, that land was good, heavy cropping land, but now it is unsuitable even for winter grazing of cattle.

3. The excessive rainfall of the three years 1944 to 1946, which were the wettest three consecutive years in the history of the district.

4. Changes due to more intensive cultivation have also had their effect on the drainage system.

The excess water of the Cust River and surrounding country meets at the end of the Cust main drain and it is at this junction in times of heavy rainfall that a backwash and consequent flooding occur. The main problem is to relieve this focal point and clear existing drains.

A drainage scheme of the North Canterbury Catchment Board proposes a diversion of the Eyre River into the Waimakariri River and the Cust River into the Eyre, with a system of cross drainage. This would help to prevent an accumulation of water in the lower parts of the district, parts of which are close to sea level, and would help to carry off much of the excess water caused by springs.

An example of the benefits of draining in the area can be illustrated by the deepening of Creig's drain at Clarkville in 1946. This lowered the water-table of the nearby country about 2ft. and enabled excellent crops and pastures to grow where before only niggerheads, rushes, and swamp plants were flourishing.

Land Utilisation

The land is used for mixed farming—sheep fattening, dairying, and cropping. If allowance is made for the number of cattle in the area, the over-all carrying capacity of the grassland is approximately 2 sheep per acre. Dairying plays a greater part than in most other areas of Canterbury; in fact, 11 per cent. of the dairy cows in milk in Canterbury are in Rangiora and Eyre Counties, which have only 4.1 per cent. of Canterbury's sown-grass areas.

The ratio of area in plantations to area occupied is also relatively great, due to there being a State forest of approximately 19,300 acres on the lighter land of the south-west.

TABLE 3—LAND UNDER OCCUPATION AND LIVESTOCK* IN RANGIORA AND EYRE COUNTIES, 1946-47.

	Acres
Area occupied	148,551
Grasses, clover, and lucerne	88,181
Fodder crops (including barley, wheat, and oats fed off)	8,724
Cash crops (including chaff oats)	15,495
Fallow land	3,508
Plantations	15,220
Unimproved land	20,411
	No.
Dairy cows (in milk)	5,955
Total cattle	12,192
Breeding ewes	86,708
Total sheep	126,724

* Statistical Report on Agricultural and Pastoral Production.

Pasture Production

The increased pasture production over the past 25 years is due to many factors, among which the evolution, distribution, and widespread use of better types of pasture plants are the most outstanding. Farmers in this district appear to have taken full advantage of the Government-sponsored scheme of seed certification. Throughout the area pastoral farming plays an important part on the arable farm, and the preparation and sowing down of pastures merit as much or more attention as is paid to the cultivation of cash crops.

Seed mixtures are studied with a view to achieving pasture production all the year round and consequently vary according to the type of soil. On light land (types 2, 3, 10, 11, 12, and 13) a typical seed mixture would contain:—

	lb.
Perennial ryegrass	20-25
Subterranean clover	3
White clover	2-3

The use of subterranean clover on this light land has been one of the deciding factors in contributing to increased pasture production.

Subterranean clover gives a tight sward to the pasture during its early growth and forms a nutritious feed even when it has dried off. It is sown on light land, particularly on Waimakariri and Paparua shallow stony loams and on shallow silt loams and shallow stony silt loams of the Eyre

[*Green and Hahn Ltd. photo.*

On the narrow strip of coastal country sand dunes have been stabilised by the extensive growth of marram grass.

and Lismore series (types 2, 10, 11, 12, and 13), where early lambing is practised in order to take advantage of the early clover growth. Subterranean clover has limitations and should be used as a means of building up the fertility of the soil to a point where it can maintain better strains of grasses and good crops of Certified white clover. The most common method of sowing is to drill the subterranean clover seed.

On the medium land (soil types 6, 7, 8, and 9) a typical seed mixture would contain:—

	lb.
Perennial ryegrass	20
White clover	2
Montgomery red clover	3
Crested dogstail	1

On good heavy land (Tai Tapu and Temuka soils) a typical seed mixture would contain:—

	lb.
Perennial ryegrass	10
Short-rotation ryegrass	15
Timothy	3
Montgomery red clover	3
White clover	2

Certified seed of the class appropriate to the use to which the pasture is to be put should be used. Short-rotation ryegrass has increased in popularity, particularly on town milk supply farms.

It lasts 4 to 5 years on good land, has all the feeding quality of Italian ryegrass, and makes good winter and early spring feed.

Porina (*Oxycanus*) and grass-grub are a serious hindrance all over the area and present an important problem, especially to the farmer on the lighter land.

Although in general it is now economic to poison the porina grub, it is nevertheless one of the factors limiting the life of pastures in the district.

Cocksfoot is an important ingredient of pasture mixtures because of its greater resistance to and quicker recovery from attacks of porina and grass-grub.

Use of Lime

A great deal of the increased pasture production is attributable to the increased use of lime in late years. On the whole the various soil types of the area show a satisfactory or very good lime response. Farmers point to the increased growth of clovers as evidence of the benefits accruing from liming.

Liming before sowing down appears to be more popular than topdressing on established pastures. This is a general practice in the counties. because pastures at the best are of a short duration and it is felt that more rapid results are obtained by applying the lime to the land in a cultivated state. In these two counties on certain areas of heavy land, notably on the Mairaki soil series, liming is as heavy as 4 tons per acre, but on an average about 1 ton per acre is used.

Some indication as to the extent liming has increased is shown by the amount of lime railed into the two counties. In 1935 approximately 640 tons were railed into the area; for 1949 the figure was nearly 8000 tons. All of the lime used comes from outside the county, mainly from Amberley and Waikari.

Increase in Topdressing

That topdressing of pastures with artificial fertilisers has increased over the past 20 years is evident from the fact that there has been an increase in artificial fertilisers railed into the two counties, from 1243 tons in 1928 to 2187 tons in 1949, and a decrease in the acreage of cash crops sown. A common practice is to topdress with 1 to 2cwt. of superphosphate per acre every other year. On the more intensively farmed areas, notably on dairy farms, annual topdressings of superphosphate are made.

Carrying Capacity

The livestock statistics for the two counties indicate that there has been only a slight increase in the carrying capacity per acre of sown grass. The increased productivity of the pastures is reflected not in an increase in total number of breeding ewes and dairy cows, but in a reduction of the acreage in green fodder and root crops and an increase in the area of sown grass cut for hay.

The acreage in forage crops decreased from 13,000 in 1920 to 8800 in 1947 and the area in grass and lucerne cut for hay has increased from 1400 acres to 6800 acres over the same period; this indicates that surplus grass rather than annual root and green crops is being used for winter feeding. The increase in surplus grass available for winter feed has been the direct result of widespread use of Certified pasture seeds, liming, and topdressing.

The growing of lucerne for hay has increased in popularity over the period. In 1928, 344 acres of lucerne were cut for hay and silage and in 1947 this had risen to 1707 acres. Lucerne does well on all but the very poorest and the wettest soil types. From 3 to 4

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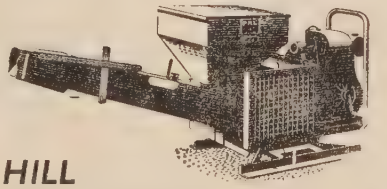

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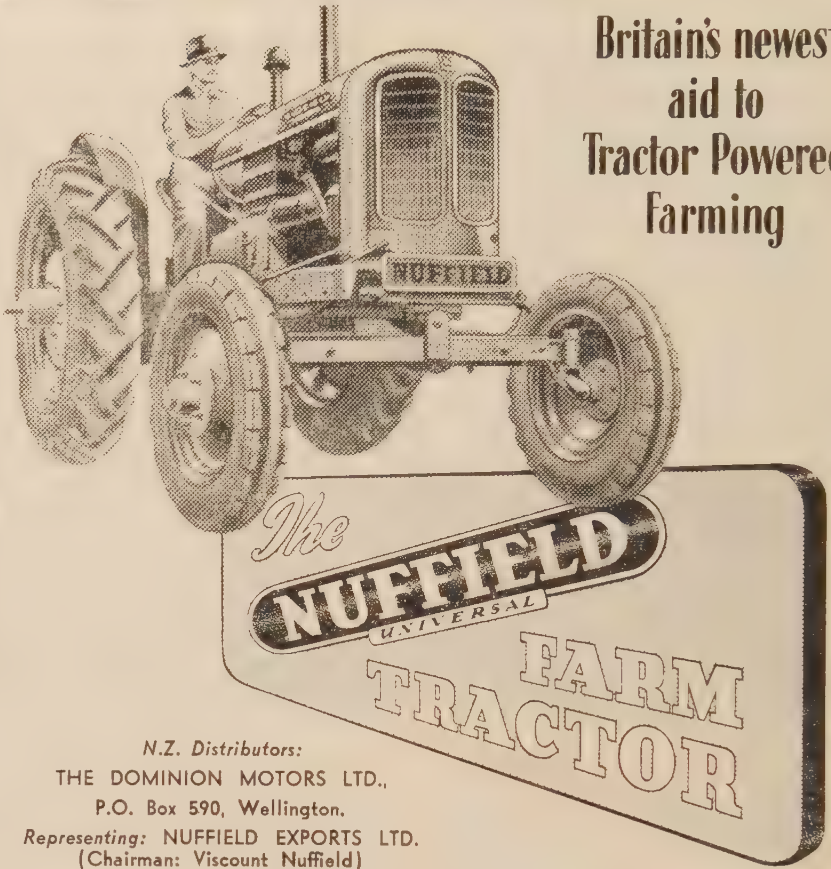

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cuts may be taken from a good stand of lucerne. There is little grazing of the lucerne except where it is used in a special-purpose pasture with, perhaps, a mixture of cocksfoot. Such a mixture will give excellent feed and is especially useful on light land provided it is not too intensively fed off.

Small Seeds

Small seeds include perennial and Italian ryegrass, cocksfoot, crested dogstail, and clover (red, white, subterranean, and strawberry).

The area of small seeds harvested in the district has always been relatively large, although it is subject to changes with price fluctuations. For instance, over the past few years high prices have caused a marked increase in production of small seeds.

TABLE 4—AREA SAVED FOR GRASS AND CLOVER SEED

Year	Area (acres)
1920	3,677
1925	4,327
1930	1,438
1935	5,448
1940	2,680
1945	5,005
1947	8,436

The fluctuations in production also show a marked relation to the number of breeding ewes. Breeding ewe numbers rose from 75,000 in 1935 to 97,000 in 1938, while the acreage in small seeds dropped from 5400 acres in 1935 to 2900 acres in 1938. This would be related to the recovery of lamb prices after the slump and the extra profit in producing fat lambs as against producing small seeds.

Yields of seeds vary greatly with the seasons, but an average yield of ryegrass on the light land (for example, Eyre and Lismore shallow silt loams) is 10 to 12 bushels, increasing to 25 bushels on the heavier soils. Yields of clover seeds vary from 50lb. of machine-dressed seed per acre on medium to light land to 200lb. on the heavier land.

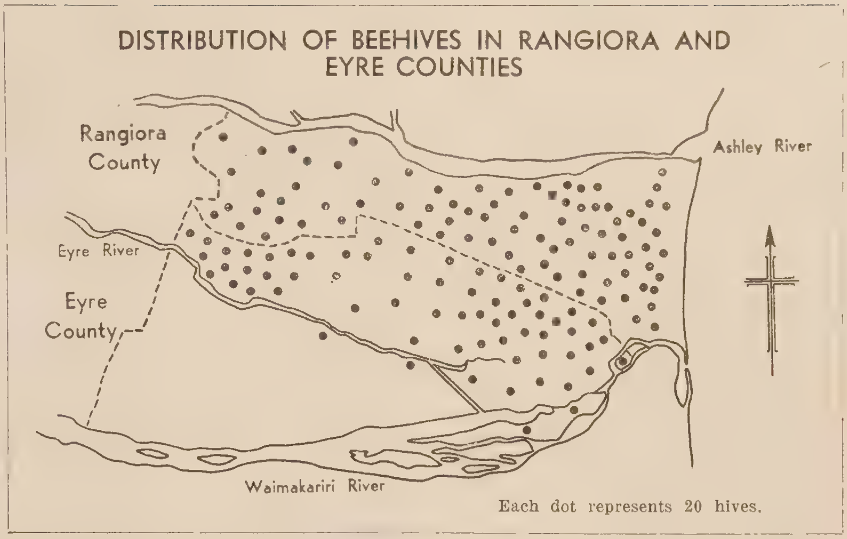
It is the policy of some farmers to grow small seeds only when it fits in well with the general rotation or farming programme. Most farmers in the area harvest some seed, but in general they consider small seeds more as a very profitable sideline. Naturally, if they were seed specialists they would vary their seed mixtures accordingly.

Beekeeping

The area is well suited for beekeeping, giving on an average 70lb. of honey per hive.

The importance of bees in pastoral farming with a rotational system incorporating the growth of legumes cannot be overestimated.

It is essential that a district such as Rangiora and Eyre should be well supplied with bees and it would appear that the district is well stocked with beehives, having an average of 10 hives per square mile. The map on this page shows the distribution of beehives in the district. It may be noted that the areas having better pastures have a greater concentration of bees, although if the area is more intensively cropped, as around Clarkville, the concentration is not so high.



DISTRIBUTION OF BEEHIVES IN RANGIORA AND EYRE COUNTIES

Crop Production

Owing to the effects of climate, particularly the comparatively low rainfall and the poor moisture-retaining qualities of the soils, the majority of pastures are short lived, seldom lasting longer than 5 to 6 years. Therefore, a mixed arable type of farming is almost inevitable, cash crops and pastures being complementary rather than competitive in the pattern of land utilisation.

A system of rotation farming is adopted in which pastures are followed by forage and cash crops, which are alternated in such a way as not to impair soil fertility.

Cash Crops

Wheat: There was a sharp decline in the wheat acreage after 1922. This drop may be attributed to the fall in price of wheat from 90d. per bushel in 1920-21 to 58d. in 1923-24. There was a change-over to dairying and this is indicated by an increase in the number of dairy cows in the counties from 5088 in 1920 to 7929 in 1924.

The rise in the wheat acreage after 1926 is explained by the recovery of wheat prices and the fall in butterfat prices. In fact much of the land devoted previously to dairying was unsuitable for the purpose. The wheat acreage remained at a fairly high level during the depression years, although wheat prices fell considerably. This was because wheat, being dependent on a local market, was more stable in price than lamb and wool prices and gave a quicker cash return.

Since 1936 the wheat acreage has declined, due to the following factors:—

1. The high prices of fat lambs and wool, together with the small amount of labour required for their production.

2. The natural desire of the farmer to maintain and build up his soil fertility while he can, so that when the need arises he will be able to "cash in" on the stored-up fertility by growing cash crops without detriment to his land.

An indication of the drop in the wheat acreage can be obtained by considering the wheat resources of a local flourmill. Twenty years ago the mill obtained all its wheat from the neighbouring countryside, whereas now it gets 60 per cent. from outside the district, although the annual output of flour and bran, etc., has not increased. The wartime increases were due to farmers responding to the call to grow more wheat. One of the factors causing the wheat land to be used for other purposes is the overwhelming growth of weeds, particularly obvious in the Clarkville and Ohoka districts.

Wheat is placed in the rotation when the fertility is highest; it is usually sown in winter after grass or after a green fodder crop, depending on the fertility and condition of the soil. Cross 7 variety has practically replaced Solid Straw Tuscan, as it heads better and gives better yields. Hunters and Dreadnought varieties are more popular on the heavier land.

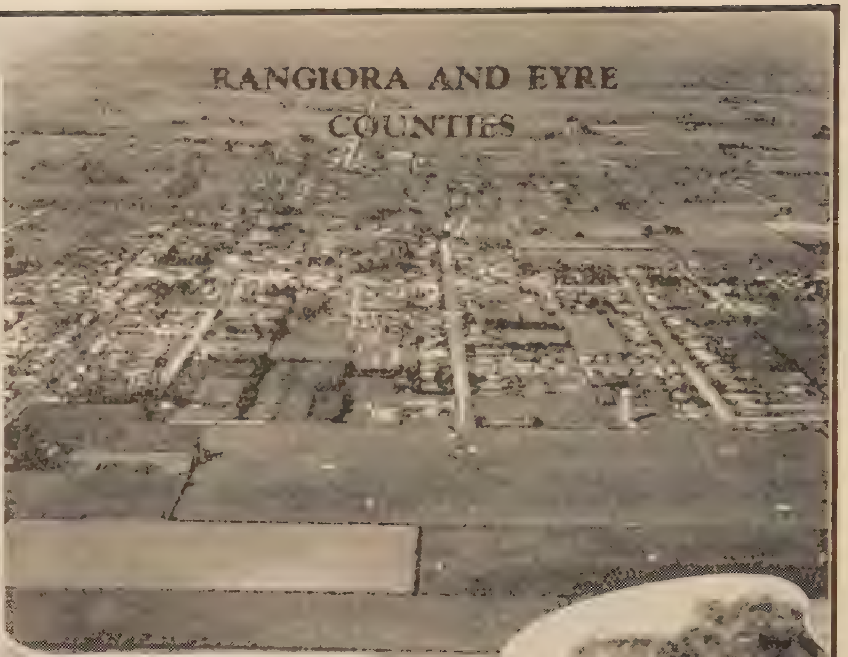
Oats: The area in oats, both as a cash crop and for chaff, has decreased to an even greater extent than the wheat acreage. The acreage of oats for threshing has dropped steadily from 4843 acres in 1920 to 1529 acres in 1947, the chief reason for the decline being the general reduction in the acreage of cash crops explained previously. Another important factor contributing to the decrease has been the replacement of horses by tractors as a farm motive power, as a considerable area of oats was grown for oaten chaff when horses alone were used for draught.

The principal variety of oats grown is the Gartons Abundance, which is sown, usually in the spring, at about 2 bushels per acre with approximately 1cwt. of superphosphate.

Potatoes: The acreage in potatoes was fairly constant over the period 1920 to 1945, although there was

RANGIORA AND EYRE COUNTIES

Throughout Rangiora and Eyre Counties pastoral farming plays an important part, but because of the comparatively low rainfall and the poor moisture-retaining qualities of most soils pastures are short lived. Therefore, a mixed arable type of farming is inevitable, cash crops and pastures being complementary rather than competitive in the pattern of land utilisation. Some parts of the counties are admirably suited to dairying, a feature of which has been the change-over in recent years from factory supply to the production of town milk, which is sent to Christchurch. The two counties are well stocked with beehives, and the average yield is 70lb. of honey per hive. The photograph at upper right shows the township of Rangiora and that at middle left the Mairaki Downs.



[Photograph at top right by V. C. Browne; other photographs by Green and Hahn Ltd.

a marked rise from 1926 until the end of the depression, in 1935. That year 2059 acres were grown, but the acreage dropped to 1431 acres in 1937. The rise in 1926 can be attributed to the increased overseas demand for potatoes and the resultant attractive price. The acreage remained high during the depression because as a cash crop potatoes gave a relatively good return. Since 1936 the acreage has remained fairly constant, except for a considerable decline in 1947.

Potatoes usually follow grass in the farming rotation. Because of the intensive inter-row cultivation, potato crops are useful in cleaning up old pastures and leave the ground well prepared for winter wheat.

There is some excellent ground for potatoes in the district, particularly on the free-working silt loams of the Temuka and Tai Tapu soil series. These soils occur chiefly around Rangiora, Flaxton, Wilson's siding, and Wetheral, where yields average 7 to 8 tons per acre.

Of the varieties planted in the district Aucklander Short Top and Dakota predominate. Harvesting is done in May, June, and July. The labour shortage during the war has induced far more mechanisation in the form of mechanical planters, diggers, and in some cases baggers. Fortunately, most of the area is situated where school labour can be obtained to assist in harvesting.

If possible the table potatoes are sold off the paddock, and the seed potatoes are pitted and graded. Otherwise, the whole crop is pitted as one sample and graded by itinerant graders who tour the district during winter. Some of the farmers always hold the crop in storage, for although it may entail two or more gradings, they are compensated by the higher prices offering later in the year.

Barley: The area of barley for threshing is shown in Table 5.

TABLE 5—AREA IN BARLEY FOR THRESHING

Year	Area acres
1936-40 average	447
1941	1097
1942	1244
1943	1439
1944	1377
1945	1576
1946	2537
1947	2310

The unusual rise in the barley acreage during and since the war may be attributed to the following factors:—

During the war, when imports of feed barley from Australia ceased and the North Island demand was increased by more pig production, the price of feed barley rose until it was almost on a par with malting barley.

Owing to the relatively wet seasons during the later war years, autumn sowing of wheat was impracticable and as an alternative barley was sown in spring.

As a cash crop barley is sown at the rate of 1½ to 2 bushels per acre, usually with 1 to 2cwt. of superphosphate or reverted superphosphate. It is harvested in the autumn, being windrowed by the binder and picked up with the header. Yields vary widely according to the strength of the land; in general 35 to 45 bushels would be a good crop yield on light land and 60 to 70 bushels on heavier land.

Malting barley is most important in the district, specially selected barleys of the 2-row type being used, the most popular of which are Research, Archer, and Chevalier.

Linseed: Linseed as a cash crop does not fit into the general pattern of other cash crops, but depends rather on the demand for linseed oil. From 1920 until 1931 more than 1000 acres were usually grown, the area sometimes exceeding 2000 acres, but with the closing down of the linseed-oil factory at Auckland in the early 1930's the acreage fell. During the depression the price of linseed was more than halved and overseas markets were unreliable.

In the later war years the linseed acreage sown in the district increased from nil in 1943 to 802 acres in 1947. This was due in part to the setting up of a linseed-oil factory at Dunedin in 1943.

Linseed can be grown on a wide variety of soils, although a reasonable amount of rainfall is required on lighter soils to ensure a good crop. An average yield would be about 5cwt. per acre. It is a good crop in a rotation, particularly following a run-out pasture and preceding wheat. It leaves the soil well worked up and does not appear to deplete the soil fertility to any great extent. It is also a useful alternative to spring oats, wheat, barley, or peas.

Peas: Peas have also been a profitable crop on the better land of the district. Statistics indicate a steady rise in acreage, especially during the war. The total acreage in 1921 was 959 acres and this rose to 2740 acres in 1947.

The increase in acreage during the war may be attributed in the main to the increased demand for garden peas in the canning industry and the resultant demand for seed, for which garden varieties are grown in this area. There was also an increased demand for feed peas, mainly the Partridge and Prussian Blue varieties, due to the cutting off of European supplies during the war.

Peas are most suitable in the farm rotation when preceding a cereal. They leave the soil in good condition, and when the crop is harvested in February the land is easily prepared for an autumn sowing. Peas are spring-sown and may be grown out of grass ploughed early in the winter, after turnips, or after a winter fallow following wheat.

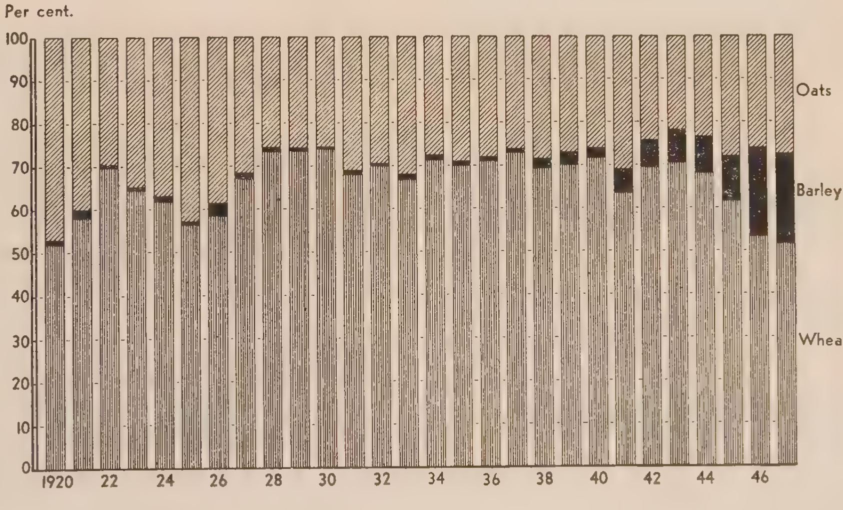
Peas which are harvested in autumn are cut with the mower, windrowed, and left to dry before being picked up by the header harvester. Many of the crops are grown under contract to local seed merchants.

Linen flax: This crop was grown purely as a wartime measure, as linen flax was no longer available from Europe. The largest area grown in the two counties was 226 acres in 1942-43. It was grown in well-drained areas at Ohoka, Waikuku, Cust, and Springbank and was sent to the Waikuku linen flax factory.

Forage Crops

In these counties fluctuations of forage crops (rape, turnips, turnips and rape, swedes, chou moellier and kale, barley, wheat, etc., fed off) are coupled with fluctuations in cash crops, as stock and cash crops compete for the use of the land. Thus, land utilisation tends to swing toward that type of production which at the time is most profitable; that is, when lamb prices are relatively more profitable than wheat prices the forage crop acreage tends to rise and cash crop acreage declines. This applies in general, but during a depression, when all prices are uniformly low and the farmers are seeking to maximise their incomes by exploiting to the full all the avenues of farm production, the acreage of both cash crops and forage crops is at a high level. This was evident during the years 1930 to 1935. From 1935 to 1943 the competitive

PERCENTAGE VARIATION IN AREAS IN WHEAT, OATS, AND BARLEY IN RANGIORA AND EYRE COUNTIES



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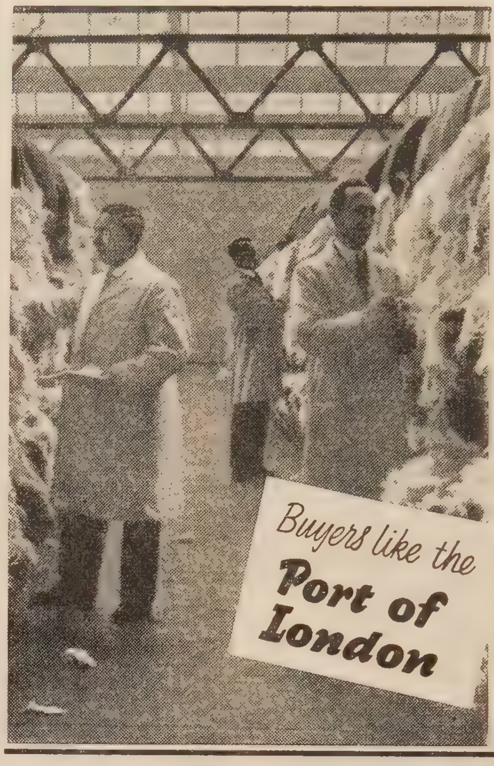

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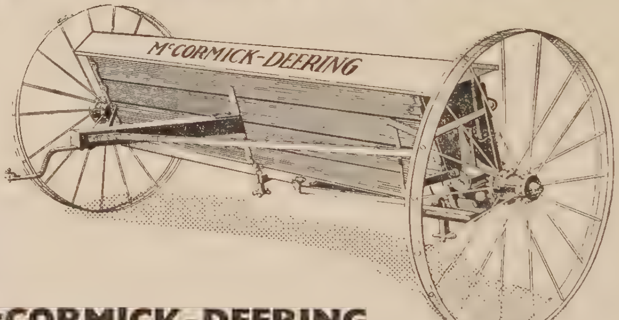

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3. Force feed ensures positive distribution even of damp fertilizer.
4. Lightest Draft distributor on market. Extremely simple construction lowers maintenance costs. Slow moving distributing mechanism. No excess weight.
5. Durable construction. Steel wheels, bottoms lead-coated to resist corrosive fertilizer action.
6. Easily cleaned. In 5 to 10 minutes one man can easily remove, clean and re-assemble all distributing parts.
7. Convenient filling height. Ejection opening near to ground yet high enough for working rough fields.

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Excellent crops of rape may be grown on light to medium land, provided summer rainfall is normal.

factor re-emerged and the acreage of cash crops and forage crops varied more or less in inverse ratio.

Rape: Rape has always played a leading part as a summer and autumn fattening crop. It also plays an important role in the preparation of land for wheat and as a restorative after wheat; it is a common practice to sow down pastures in the spring with a light crop of rape.

Excellent crops of rape may be grown on light to medium land, provided summer rainfall is normal, but rape on Tai Tapu and Temuka soils is inclined to become too leafy and watery and to scour the lambs. The time of sowing depends on the individual farmer's programme but it is general to sow in breaks of fortnightly intervals from November to January.

Turnips: This is also an important forage crop in the district, although in the past 25 years it has lost some popularity and now forms about 30 per cent. of the total fodder crop acreage, against 40 per cent. in 1920. This gradual fall in the acreage of turnips may be attributed to the susceptibility to club-root disease and attacks by the brown beetle. The general change from factory to town-milk supply has also caused a decline in the turnip acreage. As turnips have a tendency to taint the milk if fed directly before milking, the trend is more toward hay and silage for winter feed. Turnip yields vary from 25 tons per acre on light land to 45 to 50 tons per acre on heavy land.

The crop can be followed by an autumn sowing of wheat if fed off as early as May, but generally it is followed by a spring-sown cereal or another green fodder crop after a short fallow. It is usually sown in summer (December) on land ploughed out of grass in winter and after a green fodder crop. The time of sowing is determined by the movement of the brown beetle, the adult of the grass-grub. This beetle is usually in full flight during November and in early December, when it feeds ravenously on turnips in the smooth-leaf stage, that is, 5 to 10 days after germination of the seed. To avoid brown beetle damage, it is usual to sow turnips after the first week in December.

A mixture of turnips and rape is now popular. The two crops when sown together serve a dual purpose as a summer and winter feed crop.

Chou moellier: Chou moellier and kale have gained popularity as a supplementary feed crop only in the past 10 years. The growth of dairying for town-milk supply, particularly in the Waikuku area, and the need for supplementary winter feed for milking cows has raised the demand.

Chou moellier is a good feed for cattle, stands high, is easy to grow on the stronger soils, gives much bulk, and fits in well with hay or silage in providing a balanced diet.

It may also be used in place of rape as a summer fattening feed for lambs, but this practice is not popular in the district, as kale does not appear to do as well as rape on the lighter land.

The cultivation and place in rotation of chou moellier are similar to those of turnips. The time of sowing depends on the use of the crop, but as a winter feed it is sown in October and November.

Swedes: A very small acreage of swedes is grown, mainly on the wet, sour ground, where swedes give a better and more reliable yield than turnips or chou moellier.

Greenfeed: Barley and oats as greenfeed are special-purpose crops grown to produce nutritious forage at special times of the year; for example, for flushing ewes in March or April before tupping, for lambing ewes in August, and for milking cows in autumn or early spring.

Mangolds: Over the years the acreage of mangolds grown has dropped until it is now of little importance. There are many reasons for this, one of the main ones being the use of alternative feed such as chou moellier, kale, lucerne, and hay.

Livestock

Livestock have always been of some importance in the two counties and over the past 27 years have increased at the sacrifice of the acreage in cash crops. The relevant figures show that the number of dairy cows in milk rose from 5088 in 1920 to 5955 in 1947 and sheep numbers rose from 104,482 in 1920 to 126,724 in 1947, whereas the acreage in cash crops dropped from 21,476 in 1920 to 13,971 in 1947.

Sheep: Fat-lamb production, which has increased over the period, forms the main part of the farming programme on Eyre and Lismore shallow silt loams and other light soils. The increase in breeding-ewe numbers from 58 per cent. of total sheep in 1920 to 69 per cent. in 1947 is a fair indication of this. Changed methods in breeding fat lambs are indicated by Table 6, which reveals the extent to which the Southdown has replaced Border and English Leicesters.

TABLE 6—BREEDS OF RAMS AS A PERCENTAGE OF TOTAL RAMS IN RANGIORA AND EYRE COUNTIES

	Border and English Leicester Per cent.	Southdowns Per cent.
1920	54.1	14.9
1930	23.4	41.9
1940	8.6	62.9
1945	9.8	58.8

The rise in the use of the Southdown ram is due to changes in the demand of the Smithfield market for the smaller joint characteristic of the Southdown. The Southdown has the advantage over the Leicester in that its progeny are quicker maturing and kill out at prime weight and at an earlier age (3 to 4 months). The decline in the Southdown percentage from 1940 to 1945 is due to a modern trend toward the Romney breed.

The main breed of ewe is the half-bred, but there is a tendency for three-quarter-breds and Romneys to become more popular on the heavier land. Stud breeding of all types of sheep is common to the district. One stud sheep of interest is the Merino, which is bred on light land (Eyre shallow silt loams) at Fernside and Swannanoa for sale to high-country runs.

Owing to the nature of farming it is usual for farmers to buy in their replacements, but in the last 25 years many farmers, especially on the lighter land, have taken to breeding their own replacements. It enables them to maintain more even flocks and frees them from the risks of price fluctuations.

The lambing percentage varies with the seasons and other conditions, but on the average it is fairly high—about 100 to 110 per cent.

Dry sheep are usually shorn about October and wet sheep in November and December. Some farmers shear before lambing. Two of the main reasons are that it is easier to get shearers before the November-December rush and some farmers hold that ewes lamb more easily and take to shelter more quickly, so affording the lamb more protection. Pre-lambing shearing is of course not practical unless there are good shelter belts. Dipping is done about February or March and goes on into April. Crutching is carried out about May or June, usually before sheep are put on winter feed, in order to prevent any tendency to scour.

Cattle

Unlike most of the Canterbury Plains parts of Rangiora and Eyre Counties are admirably suited to dairying. Dairy cows form about 50 per cent of total cattle. Beef cattle play a relatively insignificant part in the farming programme; they are run mainly on the heavier, wetter parts of the area.

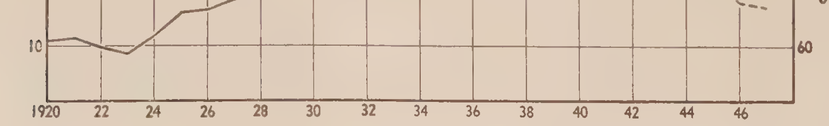
Dairying predominates mainly on the heavier soils about Tuahiwi, Flaxton, Camside, and Waikuku. The number of dairy cows has not changed significantly in the past 15 years. The total was unprecedentedly high in 1922 because of high prices offered for butter by the United Kingdom and the settlement of returned soldiers on the land. The drop in numbers after 1924 was due to a fall in overseas prices, and the rise during the depression is attributed to farmers wishing to sustain gross income despite falling prices. Since the depression the number of dairy cows has been fairly constant.

The most notable feature of dairying in the district is the change-over from factory to town-milk supply due to the extra urban demand and the utilisation of good dairying land for building sites in and adjacent to Christchurch. In the last 2 years 13 dairy farmers in the district have changed from factory to town supply. In 1946, 6000 gallons of milk were carted daily by the Canterbury Co-operative Dairy Company, the sole transport company in the district carrying milk; in 1948 the figure reached 11,000 gallons daily in winter.

Pigs

In the two counties pigs play a comparatively minor part and the total number of pigs has decreased from 4618 in 1925 to 2158 in 1947. There are no pig farms of importance in the district and most pigs are run in conjunction with factory-supply dairy farms. The decrease in the number of pigs may be attributed to the change-over from factory to town-milk supply and also to some extent to the prohibition for several years of the sale of cream for consumption.

NUMBER OF BREEDING EWES AND AREAS DEVOTED TO CASH CROPS IN RANGIORA AND EYRE COUNTIES



Farm Management Systems

Systems of farm management are related to soil types (for numbers of types reference should be made to the map on page 354) as follows:—

Extensive Farming (Soil Types 10, 11, and 12)

The soils on which extensive farming is practised are droughty and leached of plant foods. In an unimproved state the cover is mainly hairgrass, browntop, sweet vernal, and weeds, but the use of subterranean clover, superphosphate, and heavy dressings of lime (up to 3 tons per acre) can effect great improvement to pastures.

Because of the nature of the soils and the lack of irrigation, the moisture content is low, while the stony topsoil and the naturally low fertility combine to make the production of cash crops and fodder crops for fattening purposes uneconomic. The main products are wool and some store stock.

The land, which carries about 1 sheep to 3 acres, is used chiefly for wintering old ewes and wethers, principally half-breds. Foot-rot is uncommon and the risk of infection is lessened by the breeding of replacements.

In general the value of the land ranges from 15s. to 30s. per acre and 2000 to 3000 acres are an economic farming unit. Much of this land, which is situated around the Eyrewell plantation, is run in conjunction with the more fertile Waimakariri and Paparua soils along the south bank of the Eyre River.

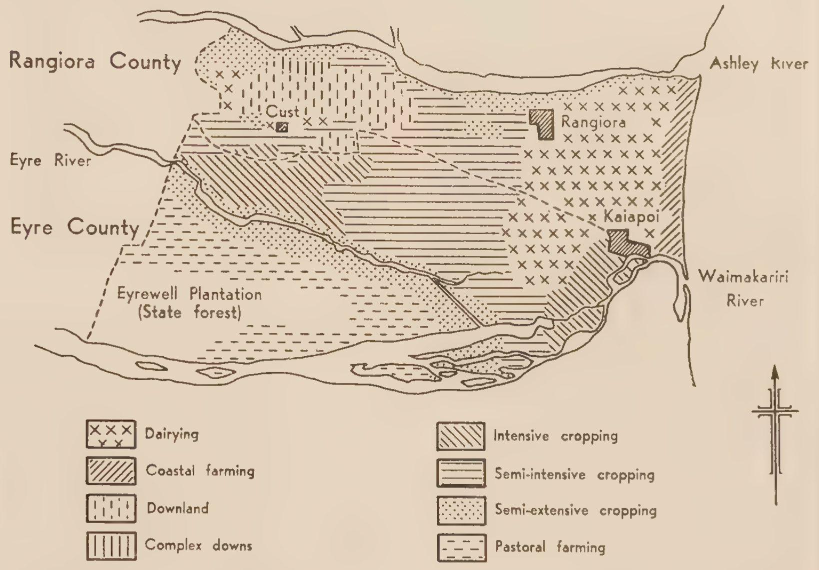
Arable Mixed Farming

Semi-extensive cropping (soil types 2, 3, 4, 5, 11, 12, 13): This area is typical of the land about the Eyre River and around Fernside, as shown on the map of farming systems on page 365. The soils are sandy loams and silt loams, mostly with stony topsoils. The area is capable of supporting fairly good pasture provided sufficient moisture is available, although the porous nature of the soil results in rapid drying out during summer.

Typical pastures on this land are of a short-rotation type, being ploughed up after 4 or 5 years, by which time reversion to sweet vernal, hairgrass, and twitch has occurred. The use of subterranean clover has enabled the building up of fertility until much of the land is now capable of supporting white clover. The principal feed crops are rape and turnips. Cereals can be grown as fodder crops to fit into a rotation, but when harvested they give only light yields.

The main products are wool, store stock, some fat stock (principally fat lambs), a small amount of cereals (mainly wheat), and some small seeds (principally clovers). There is a fair response to lime and fertilisers, but the limiting factor is the lack of moisture. and a system of irrigation would transform this light land into high-producing country comparable with the best in Canterbury. Lucerne will grow on the deepest parts, giving an average yield of 2½ tons per acre from

PRINCIPAL SYSTEMS OF FARM MANAGEMENT IN RANGIORA AND EYRE COUNTIES



two cuts per year. Peas are not usually grown, except perhaps as a preparatory crop for grass.

In general the price for the land is £4 to £5 per acre. It is capable of carrying 2 sheep to 3 acres if well farmed, ewe flocks being principally Corriedales and half-breds.

Semi-intensive cropping (soil types 4, 5, 6, 13): This is typical mixed arable farming land, characteristic of the Canterbury Plains, producing principally fat lambs, grain, and small seeds.

The pastures are of a relatively short duration, seldom lasting more than 5 years. Cocksfoot grows well and is more resistant to porina (*Oxycanus*) and grass-grub. The use of Certified seeds has lengthened the life of pastures to some extent, but it is still the practice to plough up pastures after 4 or 5 years because of the dying out of the sown grasses and the depredations of the grass-grub. Under conditions of normal rainfall (25 to 27in. per annum), however, this land is high producing.

In the two counties a considerable area of the average cropping land is affected by the undercurrent, which makes cropping rather hazardous, although a number of farmers claim that the undercurrent is beneficial to the land, especially in dry seasons. Rape and turnips form the main fodder crops, with a tendency for chou moellier to replace the turnips to some extent. Breeding ewes are mainly Corriedales. Though it is most common for farmers to buy their replacements rather than breed them, there are some stud flocks of the English Leicesters, Southdowns, and Romneys.

This land is capable of producing good crops of wheat with an average yield of 35 bushels per acre. Oats and barley are popular, both as fodder and cash crops, yielding on the average 45 bushels per acre. Small seeds, especially in recent years, have played a very important part in the cash-crop programme. Red and white clover are the most important in this respect, although the growing and harvesting of short-rotation ryegrass for seed is gaining popularity. Lucerne grown for hay is becoming more popular, as it grows well on this type of land, especially on the deeper soil types of the Waimakariri, Templeton, Paparua, and Eyre series.

This type of land, which is capable of carrying slightly over 1 ewe per acre, may be valued at up to £20 per acre. An economic farming unit is about 250 to 400 acres.

Intensive cropping (soil types 6, 7, 8, 9, 14): This area contains good, heavy moisture-retaining soils of high fertility, capable of withstanding drought.

Pastures are of the short-rotation type essentially associated with arable farming. They can be used for either hay, grazing, or small seeds. Because of high prices for fat lambs in recent years, the tendency has been to leave pastures down for longer than the usual 4 to 5 years, as the soils are able to support the longer rotation, and to limit cash-crop production in favour of pastoral farming.

However, wheat still plays an important part in the farming programme on this type of land. In a good season yields up to 70 bushels per acre can be expected, the average being about 50 to 60 bushels per acre. Linseed also produces well and has been grown much more extensively since 1944, in which year 66 acres were grown against 900 acres in 1946. Oats and barley give yields up to 80 bushels per acre. This land is heavy enough to grow cereals, principally wheat, on the first furrow. It is deep ploughed in April, harrowed several times, and seed is sown in May. Peas and potatoes also play an important part in the cash-cropping programme.

Forage crops, (mainly rape, turnips, and chou moellier) are grown as supplementary feed crops. Lucerne as a hay crop is cut three or four times a season, yielding 1 to 1½ tons of hay per cut.

Small seeds are usually harvested only when good pasture growth ensures sufficient stock feed, although on some farms grass and clover seed production is made an important source of income.

On this heavy, intensive cropping land most lambs are fattened off the mothers, and main drafts go to the freezing works in January. Some of the lambs are ready for the Christmas trade.

In general the price for land is £30 to £40 per acre and the economic farming unit is 200 to 300 acres.

Dairying (soil types 14, 15, 16, 17, 18, 19): These are meadow soils of the Tai Tapu and Temuka series, heavy, very fertile, and inclined to be too wet, but they respond well to draining where it is possible. The main areas are found on pockets of land at Tuahiwi, Flaxton, Camside, and Waikuku. The heavy nature of the soils, together with their moisture-retaining qualities, enables the growth of longer-lasting and better pastures. It must be noted that although this land makes excellent wheat country, it is more profitable when utilised for dairying, especially with the expansion of the city milk supply.

Most of the areas with soils of the Tai Tapu and Temuka series are subject to up to 15 degrees of frost during the winter, and supplementary fodder crops, chiefly hay and lucerne with some chou moellier and turnips, are generally provided. Mangolds have lost popularity, although they are still grown to some extent. Some cash crops are grown on this land, which is capable of yielding as high as 100 bushels of wheat per acre in favourable seasons. Potatoes are perhaps the most important of the cash crops, yields averaging 8 tons per acre in districts such as Camside, Clarkville, and Rangiora.

Small seeds, especially clovers, are harvested when the pasture growth exceeds the stock-feeding requirements. In reality, many of these dairy farms are actually mixed arable farms, dairy cows merely replacing sheep in the livestock programme.

Drainage on much of this land presents a problem. A considerable amount of mole, tile, and open drainage is required and it is important in farming this type of land to keep drains free from weeds.

Valuations are high, rising to £70 or £80 per acre, but 75 to 100 acres of this land is sufficient for an economic single-unit farm.

Downs country (soil types 21, 21a, 21b, 22, 23): Mairaki and Taiko soils present farming problems peculiar to the Downs country.

Much of the downs was excellent wheat-growing country, but due to a period of overcropping and bad farm management, much of the fertility has been lost. During the 1920's a rotation on this land included three or four successive crops of wheat before the land was sown down in pasture. Consequently, the soil could grow only poor pastures full of twitch and weeds. Most of the area is now undergoing a rebuilding process by means of fodder crop rotations, fertilising, and liming.

A typical rotation would be: Grass is broken up and sown with either linseed or rape, or fallowed, being then autumn sown in wheat, which is harvested in February. A cereal crop for greenfeed is sown the same autumn and either ploughed in or fed off according to the feed position. This is followed by a summer fallow to remove any remaining twitch, and the land is limed at the rate of 1 to 2 tons to the acre before being sown down in grass in the autumn.

Small seeds are now important on this downland, principally red and white clover, Certified perennial ryegrass, and short-rotation ryegrass.

Once fertility has been built up the land is capable of producing payable crops of wheat, linseed, and peas. However, fat lamb and small seeds production provides the greater proportion of the farming income at present.

Proper drainage is a first essential, but it presents a difficult problem, as there is no adequate main drainage system into which to lead individual farm drains and prevent flooding of lands lower down. With suitable tile and mole drainage this land would be capable of running cattle throughout the year.

The value of the land varies from £12 to £15 per acre, depending on soil fertility.

Successful farming in the area usually requires heavy capitalisation in the initial stages, when soil fertility is being rebuilt, but there are instances where farmers without using a large amount of capital have by judicious farm management and foresight attained equally high productivity.

Hilly or complex downs (soil type 23): This small area, the steep portions of the Mairaki Downs, is not comparable with any other section in the two counties. The land is steep, broken, and unploughable, and if it were farmed to any great extent erosion problems would be met.

Small pockets are used for wintering cattle and sheep, but most of the country is still covered with original manuka scrub, though gorse is making inroads. From an economic viewpoint the planting of trees might be considered the best means of utilisation.

Coastal farming (soil types 1, 1a, 14, and 20): This narrow strip of land, about a mile inland from the coast, comprises ridges of coastal sand dunes bounding pockets of quite fertile but often saline soils (for example, Motukarara soils). The sand dunes have been consolidated by the extensive growth of marram grass, and strawberry clover provides the main constituent of the pasture on the heavier, more saline pockets of land. Where the salt has been leached out of the soil good stands of white clover and perennial ryegrass have been established, while browntop grows quite readily on the poorer soils. Strawberry clover is volunteer and farmers have no knowledge of its introduction It was first harvested for seed in 1916 and now provides quite a remunerative secondary source of income.

Dairy farming is the main activity, with some cattle and sheep fattening. Utilisation of the heavier pockets and sand dunes is complementary, the latter being used mainly as a winter run-off, thereby spelling the heavier, wetter portions and allowing stock to benefit from the drier conditions.

It is difficult to estimate the carrying capacity due to the variation of soil types, but a typical example of a farm in the area is one of approximately 600 acres (370 acres of heavy land with 230 acres of sand dunes), carrying 800 ewes and 70 head of cattle. Owing to the very quick growth in the summer it is possible to buy in and fatten sheep and cattle. The improved drainage methods utilising tidal flood gates and a more intensive open drainage system have done much to improve the carrying capacity, but because the land is low lying, drainage will always be a major problem.

Drainage Problem

Rangiora and Eyre Counties are typical of the more intensively farmed portions of the Canterbury Plains in that a considerable area of them is devoted to highly productive mixed arable farming; but one of its peculiar problems is that drainage is most important and close attention will have to be given to it before production can be raised to a marked degree.

Acknowledgments

The assistance given by officers of the Soil Bureau, Department of Scientific and Industrial Research, Christchurch, and by farmers in the district is acknowledged.

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Fruit Crop Estimates for February, 1950

THE following estimates of the fruit crop for February, 1950, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

FRUIT	DISTRICT									
	Auckland	Gisborne	Hawkes Bay	Manawatu Wanganui	Wairarapa	Nelson	Marlborough	Canterbury North Otago	Central Otago	Total
APPLES—										
Ballarat	57	10	71	1	1	5	3	7	1	156
Cox's Orange Pippin	8	3	62	1	1	121	14	17	4	231
Delicious	38	11	82	1	5	180	14	18	23	372
Dougherty	21	5	62	—	—	24	1	—	—	113
Granny Smith	69	2	70	2	2	70	2	2	1	220
Gravenstein	26	—	35	—	—	59	1	—	—	121
Jonathan	11	—	27	—	1	264	23	12	6	344
Sturmer	6	5	150	5	14	335	24	49	14	602
Other varieties	104	7	130	4	6	147	13	54	17	482
Total	340	43	689	14	30	1205	95	159	66	2641
PEARS—										
Beurre Bosc	3	—	2	—	—	5	—	—	—	10
Louise Bonne de Jersey	1	—	6	—	—	—	—	—	—	7
Packham's Triumph	6	—	3	—	—	1	—	—	—	10
P. Barry	3	1	6	—	—	2	—	1	—	13
W. B. Chretien	9	—	37	—	—	21	—	2	8	77
Winter Cole	1	1	23	—	1	32	1	7	2	68
Winter Nelis	—	1	26	—	—	8	—	2	5	42
Other varieties	10	1	6	2	1	9	1	4	5	39
Total	33	4	109	2	2	78	2	16	20	266
OTHER FRUITS—										
Peaches	60	6	135	—	—	40	—	4	45	290
Apricots	1	—	4	—	—	—	—	5	74	84
Nectarines	1	—	13	—	—	1	—	—	9	24
Plums	33	5	31	1	—	4	—	3	22	99
Cherries	—	—	1	—	—	—	1	3	9	14
Quinces	9	—	7	—	—	4	—	—	—	20

RETURNS OF SHEEP OWNED DUE THIS MONTH

UNDER Section 52 of the Stock Act, 1908, all owners of sheep are required, before May 14 in every year, to render a return showing details of the number of sheep kept as at April 30. Forms for this year's returns will be sent out by Inspectors of Stock on April 27. Any sheep owner who does not receive a form should notify his nearest Inspector of Stock, Department of Agriculture, who will see that a form is made available.

The returns are used subsequently to compile a Dominion list of sheep owners. This list is also used as an electoral roll for the election of the electoral committee of the New Zealand Meat Board and the Wool Board.

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Autumn Cultivation and its Relation to the Mechanical Condition of Orchard Soil

By J. COOMBE, Orchard Instructor, Department of Agriculture, Roxburgh.

DECIDUOUS orchards have been planted on a wide range of soil types in New Zealand and some study should be made by each grower as to the time of cultivation and the methods used to maintain the soil in the best possible condition. Orchards situated on steep slopes require to be cultivated in a different manner from those planted on flat land, and fruit trees growing on a heavy soil overlaying a clay subsoil require different cultivation methods from trees growing on a deep, loamy, well-drained soil. Wrong tillage of some types of soil can have very far-reaching effects on the productive capacity of the trees and may even cause them to die if a very wet winter is experienced.

Tractor at work cutting the land or bay shown in the bottom photograph.

SOIL structure denotes the state of aggregation of the soil particles and includes within its definition what is commonly understood by the term "tilth." The structure of the soil dominates the water-air relationship of the soil and its behaviour under cultivation. Structure in the soil is made possible by the presence of colloidal material, both organic and inorganic, binding the fine particles together into aggregates or crumbs.

Soils of single grain structure are those in which the particles exist independently of each other, due possibly to the absence of effective colloidal or binding material. In the case of sandy soils with a deficiency of organic matter this is not a serious drawback, as the spaces between the particles are large enough to allow free movement of air and water.

In some finely grained silt soils the particles can pack closely together, leaving a very low pore space, and this causes a restriction to the movement of air and water to the plant roots. This type of soil is frequently seen, as it forms a compact surface after rain. If the physical structure of a heavy soil is allowed to remain in this state, the surface dries out rapidly and cracks, thus allowing moisture to escape more quickly, and spring and summer rains are not able to penetrate so easily.

A good soil structure allows the soil to warm up more rapidly in the spring and also assists in the even distribution of moisture.

Soil Fertility

Soil fertility is very closely allied to cultivation in that adequate amounts of plant foods can be present, but because the physical condition of the soil is unfavourable the plant foods are not available to plant roots.

Analysis of clay soils sometimes shows that they have high proportions of nitrogen compounds and potash and no deficiency of phosphoric acid, yet they carry only poor crops owing to the closeness of the texture restricting the movements of air and water.

Air and moisture are essential to get the maximum production from the soil, and cultivation should be planned so that the physical condition of the soil is such that it will readily absorb any rain and also allow surplus water to drain off and not lie until it evaporates.

Poor cultivation and neglect of drainage contribute to the poor condition of an orchard, even though manuring, pruning, and disease control programmes are strictly adhered to. The production of an orchard is dependent on the fertility of the soil, and the soil should receive the first consideration when a grower is planning his programme of work.

Autumn Ploughing

By ploughing the land from the beginning of May to mid-June, before the heavy winter rains, the soil structure and fertility are greatly increased; also the packed soil caused by implements in carting off the crop and trampling during harvesting is broken up. This applies more particularly to the heavier soils, especially those overlying a clay subsoil. It will not matter if the land turns up in a rough, cloddy condition at this time of the year, as it will break down into a good friable condition in the following spring.

Even heavy land can be ploughed in quite a wet condition during autumn, but probably it would be disastrous to work a heavy soil in spring while it was in a wet condition, as the crumb structure would be reduced or lost for that season.

The alternate freezing and thawing of the moisture in the soil forces the minute particles apart and assists development of a crumb structure. Much

The natural drain left down the centre of rows of trees by land or bay after ploughing.

AUTUMN CULTIVATION AND ORCHARD SOIL

A cover crop of Partridge peas 2 months after being planted.

of the sourness is also eliminated. Although the benefit will extend through the succeeding summer, when the soil surface will be less liable to crack, the action of the frost must not be regarded as effecting any permanent soil improvement. The addition of humus is just as essential on heavy types of soils as on light soils to maintain them in good friable condition.

If it is not possible to grow green crops in readiness for ploughing under with the autumn ploughing, they can be sown immediately after this ploughing and worked into the soil in the spring. Another point in growing the green crop through the winter is that it does not take the moisture from the soil at that time of the year when the fruit is forming and requiring an adequate moisture supply.

Depth of Ploughing

Autumn ploughing should be as deep as possible, but care must be exercised to avoid damaging the roots of trees.

In orchards that have received only shallow cultivation for some years deep autumn ploughing would cause serious damage to the rooting system and could cause a reduction in the production of the tree which might never be fully recovered.

After every two or three furrows have been ploughed, commencing close to the trees, adjustments to the depth of the plough should be made until the finishing furrow in the centre of each land or bay is at least 6in. deep. The furrows should always be thrown up to the trees in autumn and they should run in the direction in which the land is sloping, otherwise drainage would be impeded and the soil become waterlogged.

Assisting Drainage

Drainage is assisted materially and erosion retarded by running the furrows up and down the slope, provided it is not excessive. Very few orchards if any are planted on land that has no slope in some direction. When a plough furrow is turned it does not lie flat on to the previous one. There is always a small pocket or hollow along the entire length of the furrow and by having the land ploughed up in a loose condition rain readily enters the topsoil, percolates through to the hollows beneath the surface, and drains off. Therefore, each furrow acts as a small drain and the finishing furrow in the centre can carry quite a lot of water without causing erosion. The finishing furrows should be opened up at each end and in any low hollows so that water can pass unrestrictedly into the drains. If heavy soil has been left in a bare condition with a good tilth as the result of summer cultivation, the first heavy fall of rain in autumn packs the surface down and then surplus water scours out channels and runs off quickly, causing erosion. Land left in this condition through winter will not only be very hard to work in spring because of its having lost its crumb structure, but it will not hold as much moisture during the following summer, and the full benefits of the manure applied will not be available to the tree roots.

Diseased fruit and leaves that have fallen to the ground are well buried by deep, autumn ploughing, and this assists disease control in the succeeding summer.

Heavy soils, especially those overlying clay, benefit most by being opened up to the weathering effects of winter conditions, but even light soils derive some benefits from this weathering.

The soil must be worked back from the trees each spring, when autumn ploughing is carried out each year, otherwise the soil becomes mounded up too much around the tree butts and the implements are more difficult to work without causing tree damage. The quickest method of levelling the orchard in spring is to plough the soil away from the trees back to the centre of the bays, but cross-grubbing or spring-tooth cultivation will also level the orchard again.

Heavy clay soils should not be broken down to a very fine tilth during summer, as they are subject to packing after heavy rains.

Type of Plough

The most satisfactory type of plough for turning a good furrow on heavy land in autumn is one with a reasonably long mouldboard. Digger or stubble ploughs have a very short mouldboard, and these pulverise and break the soil down to a very large extent as the furrow is turned. Aeration is increased by using a plough that exposes the greatest quantity of soil to the frosts. Good, clean mouldboards to which the soil cannot adhere turn better furrows and require less power to work than rusty or dirty mouldboards.

Points to Remember

Essential points to remember are as follows:—

Develop and maintain the crumb structure in the soil by autumn ploughing and the addition of organic matter.

Maintain soil fertility by growing green crops and applying manures.

Keep the drains open and allow excess water to run off as quickly as possible without causing erosion.

Plough as deeply as possible without causing damage to tree roots.

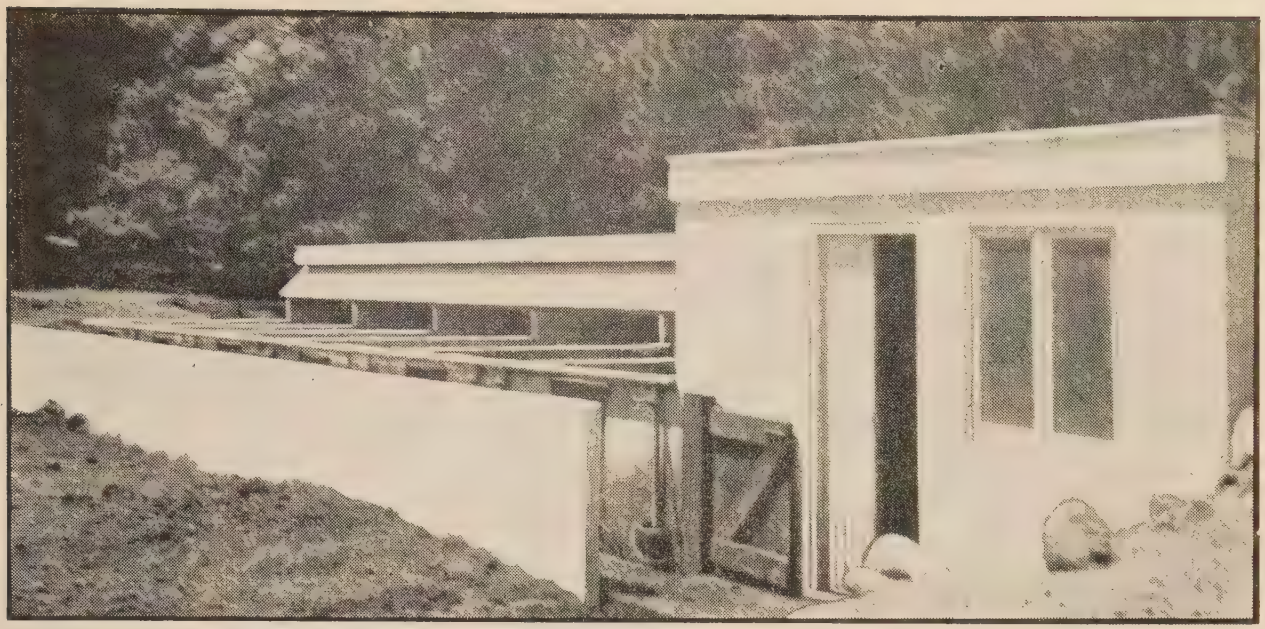
Do not cultivate heavy soils too early in spring.

Do not work heavy soils down to a very fine tilth during summer.

Do not allow excess weed growth to compete with the trees during summer in taking moisture from the soil.

The production of fruit is dependent on the fertility of the soil, and any improvement or neglect of the soil must in time be reflected in the crop returns.

Further information on the working or treatment of orchard soil may be obtained from Orchard Instructors of the Department of Agriculture.



Good Housing will Increase Returns from Pigs

GOOD housing is of great importance in efficient pig production. Pigs that are comfortably housed grow faster and use less food to do it than when housing is bad. In this article the designs of suitable pig houses are discussed by I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington.

IT is of little use having good-quality breeding stock and feeding them well if the housing facilities are inadequate. The domestic pig has been domesticated for several thousands of years, and, unlike other farm animals, it has little natural protection against the weather in the form of hair or wool. Protection must be provided for it in the form of houses to live in. In considering the design of pig houses there are two main factors: First, the comfort of the pigs; second, the saving of labour in feeding and attending to them.

Comfort of Pigs

Research work overseas has shown that pigs thrive better and grow faster if the temperature of houses in which they live is kept as even as possible—from 65 to 70 degrees F. The type of housing required is therefore dictated by the climatic conditions. The extremes of temperature reached in some pig-producing countries are not experienced in New Zealand, but there is a considerable variation and it can be very rapid. For instance, in January the temperature during the day may be over 80 degrees, yet by midnight it can easily drop to well below 50 degrees; and this is true, as the records show, of many parts of the country from north to south.

However, the main problem here is keeping the temperature inside the house higher than it is outside, as it is only for some 3 months that very warm weather is experienced, and even then nights are cool. Therefore the design of the house needs to be such that it can be kept warm easily, yet provided with means for cooling it.

The simplest way of warming a pig house is to use the body heat from the pigs themselves. Even in countries with very cold winters this method has been found preferable to using artificial heat; in New Zealand it is entirely satisfactory provided that the house is suitably designed. The extent to which pigs are able to raise the temperature of their house depends on the amount of air space per pig in the house and the amount of ventilation.

No information is available at present regarding the minimum amount of air space necessary, but it is known that pigs do well and show no ill effects when there is as little as 45 cub. ft. of air space to each pig. The greater the space the more difficult it is for the body heat of pigs to raise the temperature, and there is no doubt that in some of the houses in use today there is too much space.

Ventilation means the number of times during a given period that air in a building is changed. The more rapid this change is, the more difficult it becomes for the pigs to warm the interior of the house; finally, it becomes impossible. The problem of ventilation resolves itself into supplying the pigs with sufficient fresh air, without draughts, yet keeping the rate of change of air in the house sufficiently slow to enable the pigs to warm the house.

Importance of Sunlight

Sunlight is another factor that must be taken into consideration. In late autumn, winter, and spring as much sunshine as possible should reach the interior of the house, particularly morning sunshine. Apart from mere warmth, sunshine is a source of vitamin D and an excellent killer of germs. At the height of summer protection from the sun is necessary; this, however, does not present a problem owing to the sun being almost directly overhead and so not penetrating the house.

Finally comes the question of keeping the house cool in hot weather. It must be realised that it is only for a short period during the day and really only for a few weeks of the year that the heat is sufficient to cause any special steps to be taken to keep the house cool.

It must be remembered that pigs have no sweat glands in their skins and so are unable to keep themselves cool by this means. Animals equipped with sweat glands in the skin can exude moisture from these glands and are cooled by the evaporation of this moisture. The expression "sweating like a pig" is entirely erroneous. The only way in which a pig can cool itself is to get wet and then allow the water to evaporate off its body.

Saving of Labour

The second main factor in satisfactory housing, the saving of labour in feeding and attention, also needs careful thought. The design of houses should be such that time spent on the pigs is reduced to the absolute minimum. First, the layout of the piggery as a whole and its position

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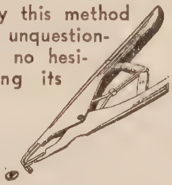

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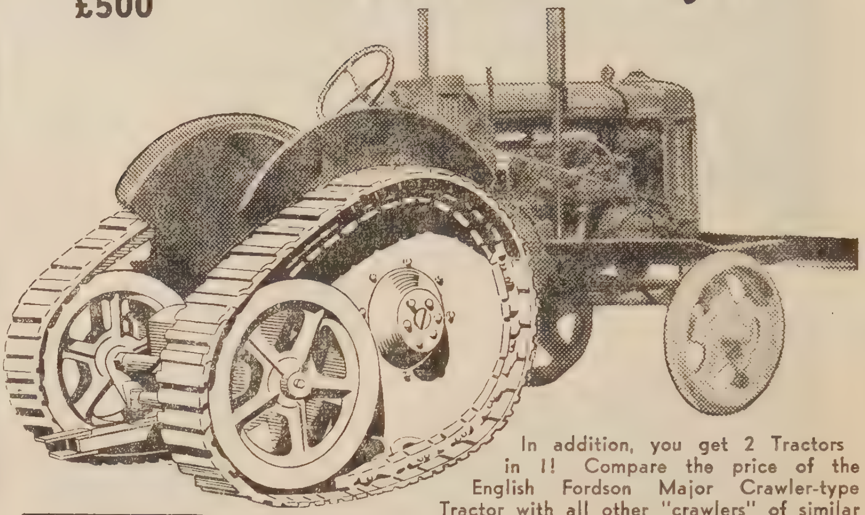

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GOOD HOUSING WILL INCREASE RETURNS FROM PIGS

Farrowing house, showing shutters for controlling temperature.

on the farm must be considered. The latter is, of course, often dictated by topographical features and for this reason a free choice is not available. There is no doubt that, when all the necessary conditions can be complied with, the ideal position for the piggery on a dairy farm is between the house and the cowshed, so that the pigs must be passed on going to and from the cowshed. In the circumstances no time is wasted in going to the pigs.

Position of Piggery

The position of the piggery should be such that it is easy of access from the house, cowshed, and road, the last so that the minimum amount of trouble is incurred in getting fat pigs away and bought foods in. Drainage must be good, and the house should be sheltered from the cold southerly and north-westerly winds. The individual units in the piggery should be concentrated as much as possible to simplify feeding, and the piping of dairy by-products direct to the trough not only saves time and labour but a lot of unpleasantness.

Design of Units

The design of individual units must be such that there is ample trough space for all the pigs that the unit will hold, that provision is made for a water trough for a permanent supply of drinking water—an important point that is often overlooked—and that there is ample dunging space. As regards the last, the pig is a clean animal and, if given sufficient room, will always use one particular place. The house should be designed so that the space is easy to get at for cleaning.

There must be access to good pasture, although it can be borne in mind that pigs will walk some distance to the paddock and will always come back at feeding time.

Design of Houses

The requirements in the design of pig houses are: Means of controlling the temperature in the house itself; adequate feeding space and dunging space; the minimum requirements in labour for feeding, cleaning, and attention.

To fulfil these requirements two distinct types of house are required: A farrowing house, in which litters are born and remain until between 3 and 4 months old, and a fattening house to which they are transferred and where they remain until slaughter age is reached. It is possible on the small farm to use one house for both purposes, but the ideal is to have one farrowing unit and one fattening unit for each breeding sow.

Farrowing House

The farrowing house is really the most important unit, as pigs live in it for the first 8 weeks of their lives, the most important period in efficient pig production; a high weaning weight is essential, and that can be achieved only under good conditions, which give the sow and litter every chance.

The farrowing house must have a sleeping compartment at least 8ft. square and completely draught proof, equipped with a farrowing rail 8in. from the floor and 8in. from the wall over-all measurement. The height from the floor to roof should be 6ft., which provides sufficient room for an attendant to stand up. The bottom 3ft. of the walls should be concrete, constructed either with boxing or blocks. The front should be open to the feeding yard, which should not be roofed over but should be able to be closed when necessary by means of shutters, hinged either at the top or side and opening inward. A permanent doorway 2ft. 6in. wide should be provided in front. This can be carried up to the roof if desired, and the top half can be closed by a shutter.

A creep in which the suckers can feed away from the sow is a necessity; there is no doubt that it is more efficient if it is built alongside the sleeping compartment and roofed over. Access to it should be from the feeding yard and another direct opening can be made between the creep and the sleeping compartment, although owing to the risk of draughts the fewer openings at floor level the better. The layout of farrowing houses should be one behind the other, in a single or double row, with access to paddocks on one side and a race on the other from which all feeding is done and attention is given. The creep should be on the side of the house next the race. The side of the creep next the race can be left open above the concrete wall, or closed, with access by means of a hinged or sliding shutter, in order that food may be placed in the creep. The creep must be at least 3ft. wide and not less than 5ft. long; it can be the full depth of the farrowing house, unless it is desired to put the door of the house at the side.

The feeding yard must be of such a size that there is ample room both at the trough and for dunging for the litter up to the age of 4 months. If

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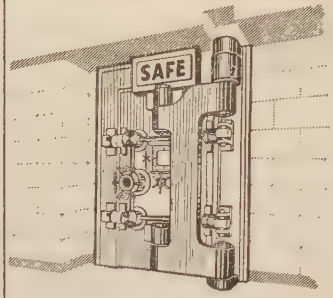

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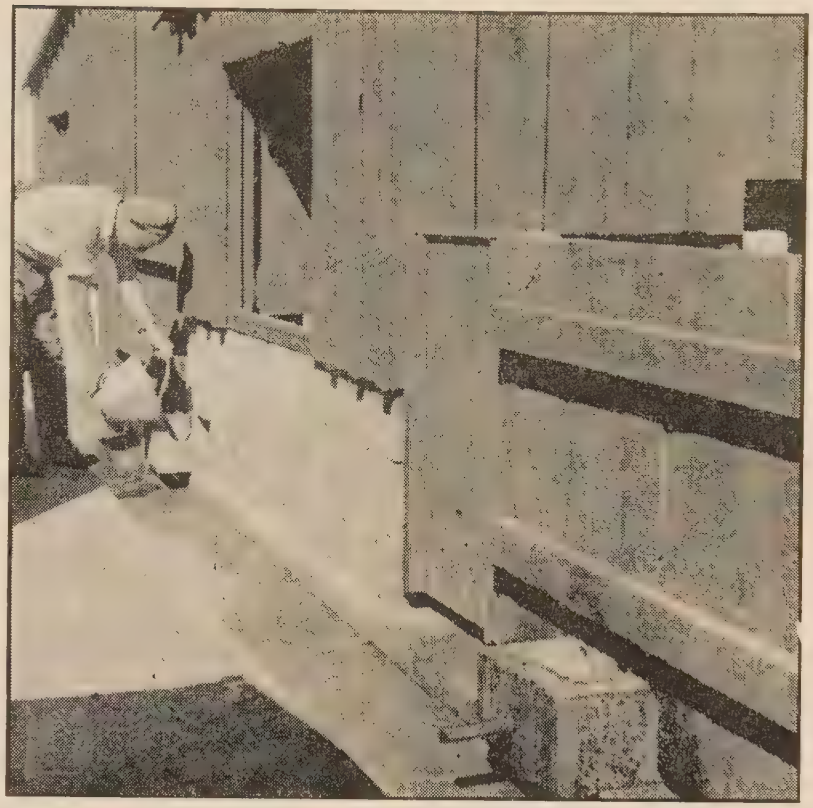
the sleeping compartment is 8ft. wide and the creep 3ft., the total width of the house is 11ft., and the yard can then be made 11ft. square, which gives ample room. The feed trough can then be placed in the middle of the yard, with the end of the trough coming through the wall on the race side sufficiently far to enable milk to be put into it from the race by either tap or bucket without going into the house. A small concrete water trough is placed in the corner of the yard against the house on the opposite side to the race and the gate to the paddock in the furthest corner from the house. The gate to the race is placed between trough and house.

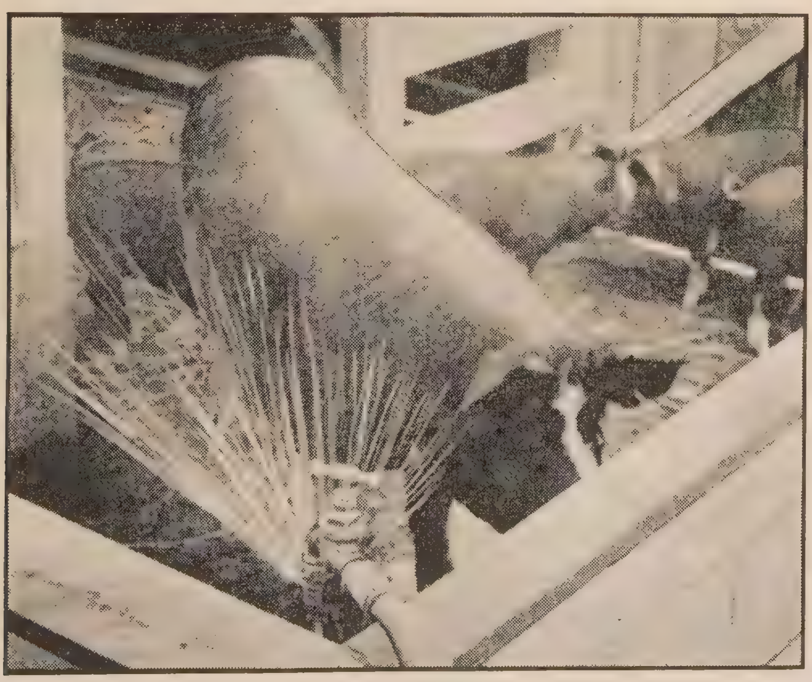
Drainage from the yard is into the main drain along the side of the race, the drain coming underneath the bottom of the wall on this side of the yard, a 3in. opening being made in the bottom of the wall for this purpose.

A water tap must be provided above the permanent water trough and should be placed well above the trough, preferably at the top of the wall of the yard. It is out of reach of the pigs here and also serves another important purpose: If in very hot weather a fine spray is fitted to this tap and adjusted so that it is spraying on to the floor of the yard in front of the house (all shutters of course being wide open) it will be found that the evaporation of this spray of water will cool the air inside the house very considerably. Moreover, pigs can get wet under the spray and so cool down. This is really the only effective method of cooling the house.

No ventilation openings need be left under the roof at the back or sides; ample ventilation can be provided by means of shutters and door opening. Permanent openings under the roof at the back or sides cause too rapid change of air in the house to enable it to be kept warm.



Feeding house showing access to trough in both feeding yard and creep from a central race, and a shutter giving access to the creep.



A fine spray of water for cooling the house in very hot weather.

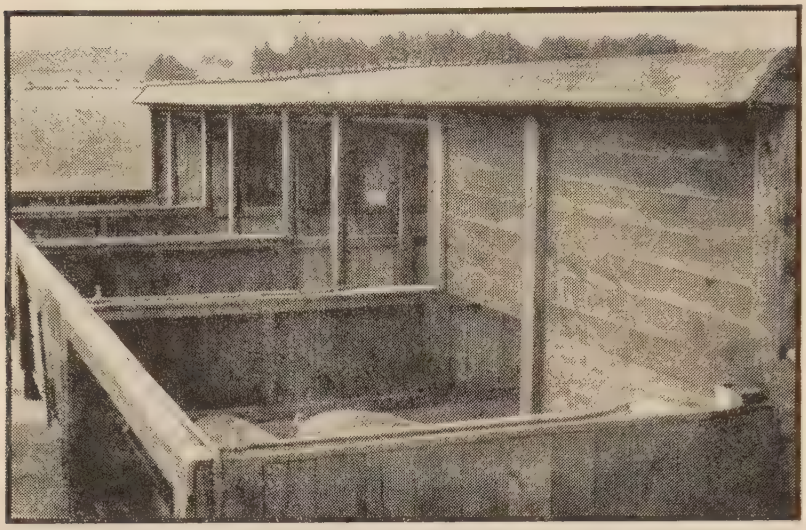
The farrowing-house design described aims to give maximum control over temperature inside the house and the greatest ease in feeding, cleaning, and attending to the pigs. The placing of the creep at the side of the house makes the feeding of suckers in the creep very simple and also provides a place in which they can be caught easily for marking. It provides a house in which pigs can be comfortably housed up to 4 months old and in which they can also be finished off if necessary.

Fattening House

The principal difference in the design of farrowing and fattening houses is that in the latter, in order to achieve more economy in building, the units are usually placed side by side under one continuous roof, a service race being provided along the front. Individual paddocks for each unit are unnecessary, one or two large paddocks in which the pigs can be let out once or twice a week being sufficient. The principles for the control of temperature in a farrowing house apply also to a fattening house, and it is in temperature control that perhaps some present-day designs are lacking.

In many cases the roof of the fattening house is taken right over the feeding yard and service race. When this is done the roof, particularly in the open-fronted type of house, has to be so high in order to admit sunshine

IMPORTANCE OF GOOD HOUSING FOR PIGS



["*New Zealand Dairy Exporter*" photo.

A fattening house fitted with shutters for control of temperature. The unit at right has the shutters in place; the units at left have the shutters removed.

that the air space per pig is too great to enable any warmth to be generated. However, steps can be taken to rectify this by taking the dividing walls between the units, which in this type of house are usually only 3 or 4ft. high, up to the roof and providing shutters at the front edge of the sleeping bed to control the movement of air. Many farmers who use the large roofed-in type of fattening house obtain the same result by placing timber across the walls surrounding the sleeping floor and storing bales of hay on it in the winter. This, however, tends to cut down the air space per pig to below the minimum which should be allowed.

In considering the design of a fattening house, careful thought should be given to the advisability of roofing the whole house or only the sleeping quarters. If the latter is done and an arrangement of shutters is provided similar to that of the farrowing house, equally good control of temperature can be obtained and the expense of the building is reduced.

There are three types of ground plan that can be used, and in all of them the sleeping compartment alone or the whole house can be roofed over. These three floor plans can be described as: 1. With no dunging race, drainage to the front under the door in one corner of the front wall, the trough placed along the dividing wall between the units, and the end of the trough coming through the front wall into the race for filling with food. 2. With a dunging race at the back and a passage along the side of the sleeping compartment connecting the dunging race with the feeding yard in the front of the house; drainage is to the back and the trough is placed along the front wall. 3. With a dunging race at the side of the sleeping floor, drainage to the back of this race through an opening in the back wall, and the trough again placed along the front of the unit.

All three ground plans are equally effective and a choice of these rests with the individual farmer. The question of roofing completely houses built according to the plans or of leaving the feeding yard open does, however, need very careful consideration. With the feeding yard left open and the front of the sleeping compartment equipped with shutters good control of temperature can be achieved and ample sunlight can reach all parts of the sleeping floor. A permanent water trough can be placed in the corner immediately in front of the sleeping compartment and the tap for this can be fitted with a spray for use in very hot weather. In the fully roofed house control of temperature in the sleeping shed can be obtained only by covering it in, which means further expense in addition to the extra roofing required.

A point which must be considered is the slope of the roof. If the sleeping quarters only are being covered the roof can be nearly flat. In New Zealand a flat or almost flat roof is entirely practical in the major pig-keeping areas, as there is no problem with heavy falls of snow in those districts and a steep pitch is not required to shed them. If the roof is flat or nearly so (a fall of 1in. from front to back), it can be made to overhang about 18in. in front, which will give added protection from the sun in summer without interfering with sunshine reaching the interior of the house in winter and spring.

This is the time when many farmers are considering building new piggeries, and it will pay them to design houses from the point of view of the comfort of the pigs themselves. Pigs which are comfortably housed do better, grow quicker, put on weight faster, and eat less food. If a pig is cold it uses the food it eats to keep up its body temperature instead of to put on weight.

All farmers contemplating the building of piggeries should get advice and assistance from their district pig council's supervisor. Plans may be obtained from him or from the Department of Agriculture. The addresses of the nine District Pig Councils are:—

Northland, Box 131, Whangarei.
Auckland, Box 43, Pukekohe.
Waikato, Box 458, Hamilton.
Bay of Plenty, Box 79, Whakatane.
Tairawhiti, Box 316, Gisborne.
Taranaki, Box 131, New Plymouth.
Wellington, Box 80, Palmerston North.
Canterbury, Box 639, Christchurch.
Otago/Southland, 83 Moray Place, Dunedin C1.

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METEOROLOGICAL RECORDS FOR FEBRUARY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum: Maximum	Absolute maximum and minimum: Minimum	Total fall	No. of days of rain	Difference from normal	Maximum fall: Amount	Maximum fall: Date	
Kerikeri	201	64.8	— 0.8	89.5	41.5	0.04	2		0.02	10, 12	204.0
Auckland	160	67.0	+ 0.2	79.3	51.0	2.01	6	— 1.70	1.06	10	210.8
Tauranga	10	64.6	— 0.3	82.7	42.4	2.53	5	— 1.37	0.96	12	242.2
Ruakura	131	61.8	— 2.1	80.7	35.0	5.58	6	+ 2.40	2.47	10	225.3
Rotorua	980	61.9	— 0.4	80.0	40.0	6.80	6	+ 2.62	2.57	11	220.0
Gisborne	12	64.0	— 1.1	86.8	40.9	2.07	7	— 1.00	0.63	10	244.1
New Plymouth ..	160	60.6	— 2.0	71.8	43.5	5.05	9	+ 0.89	2.11	9	195.6
Napier	5	64.6	— 0.8	85.2	45.6	4.20	9	+ 1.48	2.25	9	227.0
Taihape	2157	58.8	— 0.1	76.6	36.0	6.38	10	+ 3.51	3.51	9	
Wanganui	72	61.4	— 2.0	74.0	42.5	6.99	9	+ 4.21	3.40	9	199.5
Palmerston North	110	60.9	— 1.4	79.5	37.0	4.92	10	+ 2.05	2.22	10	184.9
Waingawa	350	60.8	— 1.6	83.0	35.3	3.42	10	+ 0.63	0.80	9	216.6
Wellington	415	60.4	— 0.8	80.9	44.1	1.95	7	— 1.17	0.55	12	229.4
Nelson	24	61.4	— 1.4	78.4	41.9	1.71	6	— 1.18	1.03	12	241.9
Blenheim	12	62.6	— 1.5	87.8	40.0	0.92	6	— 1.10	0.32	17	265.4
Hokitika	12	55.3	— 3.1	70.9	36.2	3.02	11	— 4.98	1.75	17	183.9
Hanmer Springs ..	1225	58.2	— 1.1	85.4	31.8	3.02	5	— 0.76	1.05	13	215.0
Christchurch ..	22	60.6	— 0.2	87.3	40.6	3.36	10	+ 1.55	1.29	17	196.1
Ashburton	323	60.2	+ 0.0	92.6	38.5	4.88	9	+ 2.27	1.89	17	162.0
Timaru	56	58.3	— 1.9	81.8	35.3	3.25	10	+ 1.02	1.42	17	183.8
Alexandra	520	61.0	— 0.5	87.5	36.6	1.34	8	— 0.16	0.45	17	209.6
Taieri	80	56.9	— 0.8	88.0	35.2	2.18	11	— 0.23	0.61	2	179.3
Invercargill ..	32	56.4	— 0.4	80.5	33.0	3.58	14	— 0.04	1.10	2	175.6

Designs of Milking Sheds for Factory Supply

By M. J. McFETRIDGE, Special Inspector, Department of Agriculture, Palmerston North.

THE planning and designing of a milking shed are of great importance to a dairy farmer. A well-planned building provides comfort and convenience for the operators, is easily maintained in a sanitary condition, is erected at reasonable cost, and is pleasing to the eye. Careful consideration must be given to the layout of the immediate surroundings to ensure that there is no possibility of contamination from mud or dust arising from the uncontrolled traffic or movement of stock to and from the dairy premises.

WHILE these comments are applicable to all farm dairies, it is pointed out that dairies registered for producing milk for town supply are controlled by the Livestock Division of the Department of Agriculture and farmers intending to erect buildings likely to be registered should apply to the Livestock Division for guidance and to make certain that the design conforms to the regulations.

Dairying is one of the oldest of New Zealand's industries, and the designing and planning of milking sheds on dairy farms have been given a great deal of thought by those associated with the industry from the time it was realised that dairying was to become one of this country's major industries.

The temperate climate of New Zealand is one of the factors which have greatly assisted the industry generally, and it was soon realised by the pioneers of dairying that plans and designs of milking sheds commonly in use in other countries were not suitable to New Zealand conditions. Many modifications were introduced from time to time; some have stood the test of time, others have long since been discarded.

The earliest sheds, following the pattern of dairying countries in the Northern Hemisphere, were mainly of the enclosed or barn type, but as this type is made necessary by climatic conditions which also necessitate the housing and hand feeding of dairy stock for varying periods of the year, it soon became evident that the type was unsuitable for New Zealand conditions. The enclosed sheds were cheerless buildings, the only light and ventilation being from the entrance door. Floors were of wooden slabs, bricks, stones, or even clay. Bails were of the back-out type, and the handling of cows was a very slow job. Some of the later sheds of this type are still used, but have long since been converted to the walk-through type, and the interiors have been completely remodelled along modern lines.

The race shed was also popular many years ago. It was similar to the barn type, except that the cows followed one another along each side of the shed and the milkers worked from a central passage, the milk-collecting room being at the end of the race.

With the development of the milking machine and the increase in average herd numbers, it was found that considerable enforced delays were often caused by the slow-milking cow restricting the speed of milking, and as this factor became increasingly important the race shed went completely out of favour and very few are to be seen in New Zealand today; many older dairy men, however, have no doubt had experience in sheds of this type. The Dairy Division did not favour the race shed, as it necessitated traffic of cows right round the shed with consequent insanitary and broken surroundings.

Need for Speedy Handling

With the advent of machine milking, which was widely adopted between 1907 and 1912, the need for speedy handling of cows in the shed increased and the open-fronted, walk-through type of shed was evolved; new sheds erected during the period 1912 to 1930 were practically all of the walk-through type. In the early 1930's some deviation from the walk-through type was made by introducing the enclosed race, which has proved very popular in some districts, though in others it has not found so much favour. The internal-race shed is generally more suited to districts subject to strong prevailing winds and cold conditions; conversely the walk-through type is favoured in districts subject to warm, humid conditions.

As the walk-through and open-fronted internal race types of sheds are the most popular designs at present, a more comprehensive description of these types will be given. The design of these types of milking sheds for factory supply has been fostered by the Dairy Division, and it may safely be said that economically, structurally, and hygienically they have proved successful and have stood up to years of hard use with a minimum of maintenance. A detailed plan of these sheds has been made by the Dairy Division of the Department of Agriculture, and

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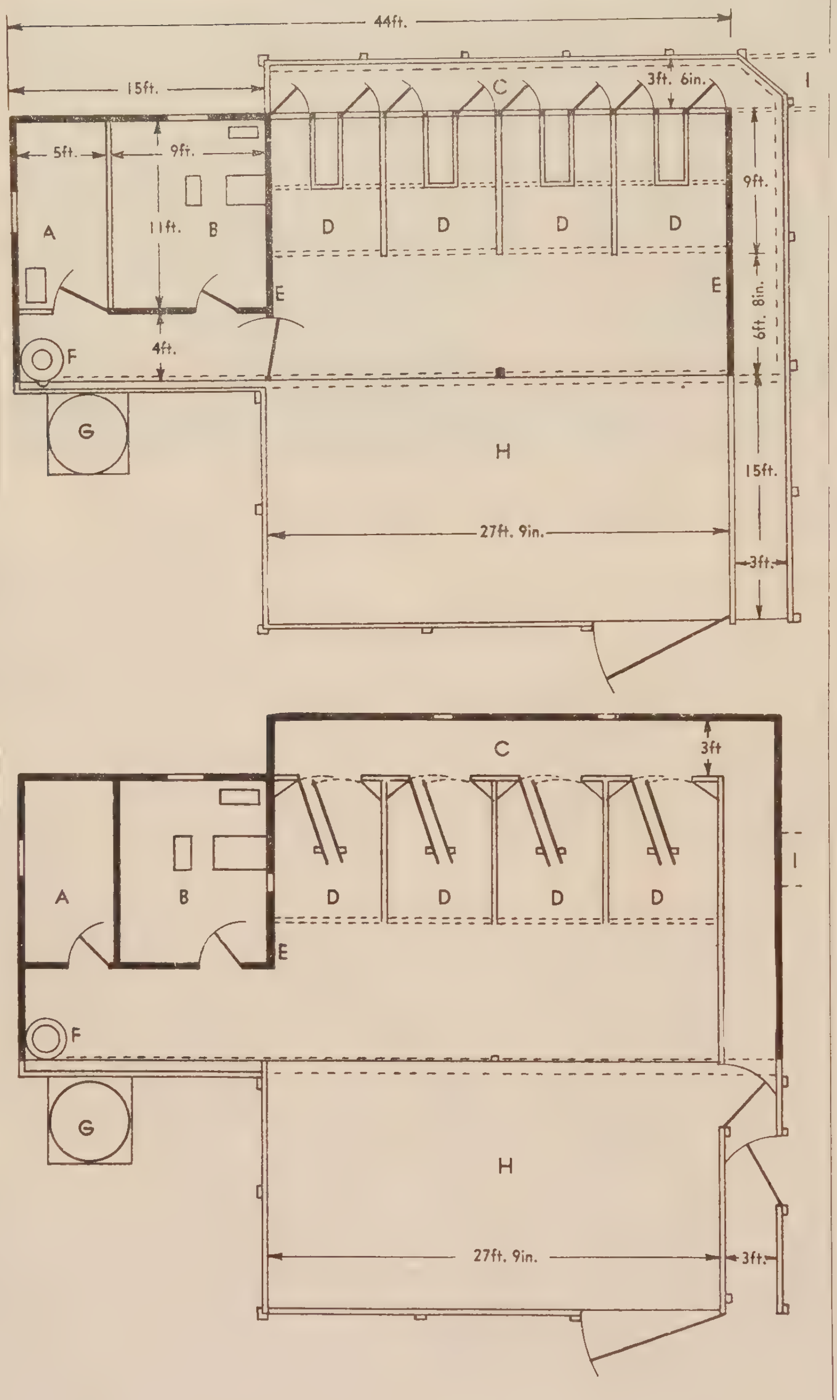
HEADING PHOTOGRAPH: A walk-through type of milking shed suitable for production of whole milk or cream. National Publicity Studios photo.

DESIGNS OF MILKING SHEDS



Simplified ground plans of external (upper) and internal (lower) race sheds.. A—Engine room. B—Releaser room. C—Race (external in upper plan, internal in lower plan). D—Bails (alternative types of dummies are shown in the two plans). E—Four-feet concrete dwarf walls. F—Wash-up copper. G—400-gallon tank. H—yard. I—Alternative race.

is available free from all main offices or from Farm Dairy Instructors. The main details of these sheds are shown in the ground plans included in this article.

Convenience and comfort for the operators are important, and there can be no doubt that a building erected according to the Dairy Division's plan gives clean, airy, and comfortable working conditions. The old days of milking in mud in any draughty old building, spending considerable time cleaning cows' udders and teats, carrying milk, and generally making hard work of milking are gone.

If the interest of young men in dairying is to be retained, it is not only reasonable but important that working conditions on the farm should be brought into line with those in other occupations, and when it is considered how many hours the dairy man spends in the milking shed each day it is obvious that every effort should be made to make the shed work a pleasure for the interested operator.

Importance of Sanitation

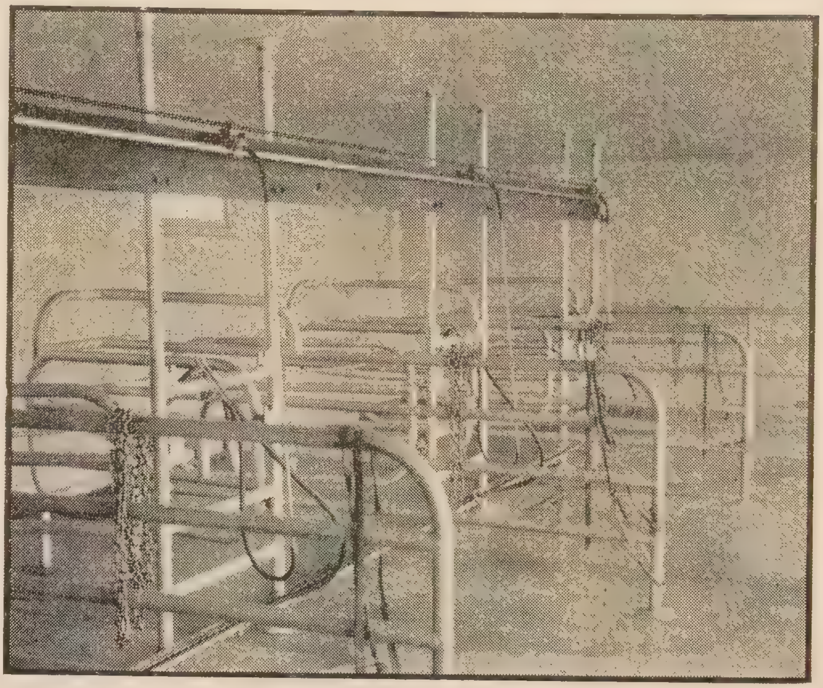
As it is most important from the point of view of the industry generally that milk and cream for the manufacture of dairy produce be produced under the best possible conditions, sanitation and hygiene must be kept foremost in mind when designing and planning a new shed. The quality of the manufactured article can be made or marred according to the conditions under which it is produced. The Dairy Division's plan has taken into account what has been learned over the years, and every effort has been made to plan a shed which will provide the maximum of sanitation; there is a sound reason for incorporating every detail in the present plan.

Cost of erection must be considered when planning a new shed, and the modern shed has been designed to give the maximum efficiency at the minimum cost. Economically, an up-to-date milking shed is a sound proposition, and is designed so that there is very little maintenance. If careful thought has been given to the site and layout, a setting can be created which enhances the value of the shed considerably at little if any extra cost.

Selecting Site for Shed

A milking shed erected according to the Dairy Division plan is intended as a permanent structure, and will, if constructed with good material, last a lifetime. It is essential, therefore, to build the shed on the best site on the farm, and many factors must be taken into account in selecting it. The principal of these are: Direction of the prevailing wind, contour of the ground, convenience to paddocks, proximity to an adequate and permanent water supply, distance from the road, and, if electricity is to be the motive power, proximity to power lines.

As milk will absorb unclean flavours very quickly, the milk-collecting or separator room should be on the windward end in relation to the prevailing



An internal-race type of milking shed with interior constructed of iron piping.

wind. The reason for this is obvious, as the area round that end of the shed is never cut up by traffic of cows and the air is always clean and sweet, whereas if the separator room is on the leeward end of the shed, the prevailing wind will blow across the race and through the shed to the releaser room, and dust and possible sources of contamination will have contact with the milk as it leaves the releaser.

Access

The site of the shed is most important, as its position dominates the layout of the farm, and a location which provides convenient access to all paddocks by the use of entry and exit races is desirable. The contour of the ground must be taken into account, and a site which links up with the general farm plan and also provides good drainage is ideal. It is unsatisfactory to site a shed on a hill top or in a hollow, except under exceptional circumstances, as invariably the surroundings deteriorate rapidly; some slight undulation is desirable, as it gives facilities for natural drainage and at the same time minimises the breaking up of surroundings.

A position which gives convenient access to the main paddocks is essential, as cows traversing their grazing spoil the pasture and in heavy country pug up considerable areas in wet weather. A shed close to a central race is best; the worst site is one in a corner of the farm where cows travel to and fro over several paddocks to reach the milking shed.

Good Supply of Pure Water

A permanent and adequate supply of pure water is very necessary to good-quality production and to facilitate the cleaning of the shed, yards, and equipment. In some districts bores can be put down close to the shed irrespective of where the shed is placed on the farm; in others it may be necessary to draw water a considerable distance to obtain a satisfactory supply. The siting of a milking shed should not be greatly influenced by this, as it is better to pump water than to ignore other factors which have greater bearing on general utility and the maintenance of good quality.

The erection of a milking shed within 2 chains of a public road is not permitted by the Dairy Produce Regulations. This requirement applies also to a major reconstruction of an existing building, but in both cases there is provision for appeal to the Director of the Dairy Division, from whom written permission to use such premises as supplying dairies must be obtained. Permission to erect dairy premises within this distance is granted only in exceptional circumstances or when no other suitable site is available. Access to the milking shed is, however, a matter which must receive consideration, as the construction and maintenance of a road to the shed, particularly in the case of milk supply, can become costly.

The distance from the power line to the shed site must be considered, as the cost of connecting the power to the shed can be uneconomic if the shed is too far from the road or main power line.

Choosing a Design

The type or design of the shed to be erected is a matter on which the farmer must make a decision, and, excepting a few fundamental matters such as concrete floors, 4ft. concrete walls at each end of the milking shed, no direct access to the releaser room from the milking shed, draught-proof partition between the milking shed and releaser room, etc., which are covered by regulation, he may deviate from the plan along lines which appeal to him. It would be unwise, however, to make any drastic alteration to the Dairy Division plan without first conferring with the local Farm Dairy Instructor.

When the site has been selected it is necessary to plan the layout. This is governed to a certain degree by the size of the shed and the herd to be milked, as provision has to be made for yarding, drainage, etc. An allowance of 15 to 20 sq. ft. per cow according to breed and whether the cows are dehorned or not should be made when planning yards. For handling large herds a crush yard is recommended, with the main holding yard either in front or at one side. The open front of the shed should always be facing north or east, preferably north, as this allows for the maximum amount of sunshine during the day. It is necessary on occasions to vary this toward the east on account of local prevailing winds, but this has the disadvantage that the early morning sun shines in on the milker, with consequent discomfort, and the benefit of the sun during the afternoon is also lost.

Structurally the main features of both the walk-through and internal-race type of shed are similar and can either be of lean-to or gable roof construction, according to the farmer's requirement and taste.

The walk-through shed is generally favoured in warmer districts which are not exposed to strong winds, as it allows the maximum ventilation because all the doors can be left open when the shed is not in use.

Complying with Regulations

The early sheds of this type were set on plates laid in concrete at floor level and the walls were of wood from floor to ceiling. This was found to be unsatisfactory, as the timber, being continually wet, perished and rot set in, the result being insanitary conditions at floor level. Foundations gave way, and it was not long before the building had to be re-erected or substantially reconstructed. Consequently, a stipulation that the walls at both ends of the milking shed shall be made of concrete to a height of not less than 4ft. from the floor of the milking shed and that the interior surface of such walls (including any portion of the top surface of any such wall which is exposed) shall be finished to a smooth plane surface with a steel tool was incorporated in the Dairy Produce Regulations. Smooth-finished concrete construction gives a much greater degree of permanence, is satisfactory from the sanitation point of view, and provides rigid walls on which to fix milking machinery. Such walls can be constructed wholly of concrete.

DESIGNS OF MILKING SHEDS . . .

The interior of the shed has been designed for efficient working according to the number of cows handled. A balanced allowance has been made in the amount of room available for the handling of cows in the shed by giving each bail 7ft.; less than this is inclined to cramp the operator, and a greater width is unnecessary.

Dummies may be supported from the floor on a raised concrete base or glazed drainpipes, or they may be suspended from the roof. The suspension method proves most effective, as it leaves the floor of the shed unobstructed. All interior woodwork should be of dressed timber, as any rough surface is difficult to clean and harbours bacteria.

Fenced Exit Race

The exit doors all open one way on to a race and divert the cows around the end of the shed furthermost from the releaser room to the main farm race or grazing paddocks. A fenced concrete exit race is most important, as it keeps the surroundings of the shed clean and ensures a pure atmosphere in the milking shed. The race shown in the plan is recommended where practicable, the milked cows being worked back to the original entrance; there is then only one point adjacent to the shed which requires regular maintenance. It is mainly in connection with the internal fittings of this type of shed that the farmer displays his own ingenuity when erecting a new shed, and various types of door handles, milking stools, cup supports, breeching fittings, draining racks, etc., are evolved with varying success; but it is rarely that any can be proved to be more efficient than those recommended by the Dairy Division.

Releaser Room

Probably the most important part of any milking shed is the releaser room, as it is here that milk or cream can most easily become affected by unsatisfactory conditions, and the proper planning and layout of this room are very necessary. First and foremost, the surroundings must be kept clean to ensure that a fresh and pure air supply is available. Good ventilation is essential, and this is not possible if the surroundings are unsatisfactory. The plan makes provision for three 9in. x 6in. vents 4in. above floor level in the back wall and two 9in. x 6in. vents in the front wall, which ensures that a draught is created which keeps the floor and walls dry (a most important factor); one or more windows (which can be opened) in the walls to provide light and ventilation; and rafters carried 4in. beyond the outside wall line, which supplies a circulation of air at the ceiling.

An additional door provides more ventilation and in many cases is convenient for the working of the shed.

A draughtproof wall the height and width of the space above the 4ft. concrete dwarf wall is required between the milking shed and releaser room. Dressed tongue-and-groove flooring placed vertically on the releaser-room side of the studs is recommended, but other materials which provide a smooth surface and can be easily cleaned are quite satisfactory.

A releaser room of the size shown on the ground plans will be found convenient and suitable in most sheds. The modern milking machine is comparatively compact, and can be fitted into about 12 sq. ft. A room which is unnecessarily large creates extra work in cleaning, etc., and too often becomes a storeroom. A room which is too small does not allow the operator the desirable freedom of movement.

When erecting a milking shed for whole-milk supply for manufacturing purposes farmers should keep in mind that at some time the shed may be required for cream supply, and it is advisable, therefore, to provide a releaser room in all sheds; if this provision has not been made, the cost of conversion may prove expensive, whereas if the original layout is planned correctly, the cost is negligible. Milk stands erected as part of the releaser room and having a sliding door through which to load the milk on to the delivery truck have given satisfactory results. The milk stand should always be well ventilated, and should be covered to give adequate protection from the weather.

Enclosed-race Shed

The enclosed-race type of shed is an alternative to the walk-through, the main difference being, as the name implies, that the exit race is enclosed in the building proper and is, as previously stated, more suited to localities which are subject to strong prevailing winds and cold conditions. It has proved very popular in some districts, and users generally have expressed complete satisfaction with the design and layout. The back and end walls are extended 3ft. to provide for the race, and it has the advantage that the whole floor, being under one roof, is easily cleaned in one operation. The bails are usually wedge shaped, and it is claimed that it is almost impossible for even a small cow to turn round in them. The dummies can be entirely suspended by spacing the rafters correctly and bracing them adequately, giving a clear and unobstructed floor. Alternatively, they may be supported from the floor by glazed drainpipes. The design of this type is set out on the Dairy Division plan. Farmers contemplating erecting a new shed of this type need have no fears regarding its efficiency and usefulness.

Inquiries are being received from time to time regarding the use of galvanised iron piping or iron piping for erection of internal dummies and partitions. Present building controls do not permit the use of galvanised iron piping, but iron (steam) piping can be used, and is satisfactory. However, supplies are short and farmers should make sure that they can get material before proceeding with any construction work.

The value of any milking shed can be considerably enhanced by painting both the exterior and interior, and good-quality paints suitable for this work are readily procurable.

It can be seen that the erection of a milking shed on a farm is a matter for very careful consideration, and any farmer contemplating the erection of a new shed or the reconstruction of an old one is urged to consult his local Farm Dairy Instructor, who specialises in this work.

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during February and for the 7 months ended February 28, 1950, with comparative figures for the same month and 7-monthly period of 1949, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

		Tons			Tons
Period	Creamery	Whey	Total	Percentage Inc. or dec.	Total in store at end of mth.
February, 1950	12,556	291	12,847	—	40,813
February, 1949	14,804	287	15,091	—	26,698
Increase or decrease	—2,248	+4	—2,244	—14.869	+14,115
For 7 months ended 28/2/50	122,134	2,222	124,356	—	—
For 7 months ended 28/2/49	113,995	1,988	115,983	—	—
Increase or decrease	+8,139	+234	+8,373	+7.219	—

CHEESE—

		Tons			Tons
Period	White	Coloured	Total	Percentage Inc. or dec.	Total in store at end of mth.
February, 1950	8,282	2,233	10,515	—	30,162
February, 1949	9,572	828	10,400	—	22,224
Increase or decrease	—1,290	+1,405	+115	+1.105	+7,938
For 7 months ended 28/2/50	58,836	16,438	75,274	—	—
For 7 months ended 28/2/49	66,428	3,469	69,897	—	—
Increase or decrease	—7,592	+12,969	+5,377	+7.692	—

If these figures are converted into butterfat equivalent, there is an increase of 7.264 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Cocksfoot Seed Production Trials

FOR the past 10 years the Grasslands Division of the Department of Scientific and Industrial Research has been carrying out trials on cocksfoot seed production. These trials, although by no means complete, have yielded much information which should be of value to cocksfoot growers. The main conclusions drawn from the trials are summarised in this article by P. D. Sears, Senior Pasture Ecologist, Grasslands Division, Department of Scientific and Industrial Research.

LIKE any other seed crop, cocksfoot requires a good standard of soil fertility to thrive and produce a satisfactory yield. The standard of fertility required for good cocksfoot growth is between the high standards required for the ryegrasses and prairie grass and the lower standards required for species such as dogstail, *Poa pratensis*, and Yorkshire fog. At the very high levels cocksfoot will of course grow well, but the great bulk of flag associated with such growth is a nuisance in the seed-harvesting process.

Cocksfoot, however, has tolerances and requirements of light and shade and grazing methods quite different from those of the other plants mentioned above. It endures shade much better than, say, ryegrass or dogstail, but will not stand up to close grazing as well as these. In this latter respect it is similar to Yorkshire fog, but its seasonal growth character is very different from that of Yorkshire fog.

Exclusion of Ryegrass

The problem of producing a high yield of cocksfoot seed is one of adjusting these factors to the advantage of the cocksfoot plants in the sward. It is necessary to maintain a high level of soil fertility so that the cocksfoot itself will grow well, while at the same time inducing shade conditions that will prevent the ingress of other plants. It is especially necessary to exclude ryegrass in view of the difficulty of dressing out the seed of this plant from that of cocksfoot. Ryegrass can be excluded relatively easily because of its great susceptibility to shady conditions, but at the same time care has to be taken to prevent going too far to the other extreme, which leads both to a weakening of the cocksfoot as well as the ingress of other weed species, especially of the twitch species.

Because of these special conditions attached to the maintenance of a weed-free stand of cocksfoot, the normal New Zealand soil fertility cycle of clovers, phosphates, lime, and stock grazing does not usually operate as effectively as with most other pasture species. With high labour costs in this country there is very little cultivation of cocksfoot in rows as in many other countries, the typical New Zealand crop area being an almost pure stand with a dense bottom of straw and flag, which is maintained purposely to prevent the ingress of weeds. For similar reasons grazing and feeding out on cocksfoot-seed paddocks are usually carried out extremely carefully, most growers preferring not to graze the paddock at all, or at the most only lightly with cattle for a short period between March and August.

Loss of Nitrogen Supply

The heavy accumulation of dead straw and leaf resulting from this treatment, though preventing weed growth, also stops the growth of clovers and thus cuts off the large nitrogen supply of these valuable plants. In such clover-free stands the only supply of nitrogen is from the decomposition of the straw and leaf and the action of free-living soil bacteria. In most pure crops this supply of nitrogen is far from adequate.

Another method of nitrogen supply may consist of feeding out on to seed paddocks in winter. Providing that this grazing is carefully controlled, this method can be very effective and

HEADING PHOTOGRAPH: Harvesting a crop of cocksfoot grown for seed.

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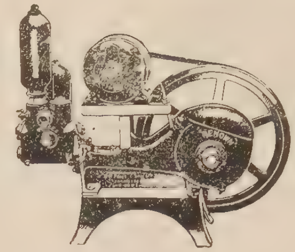

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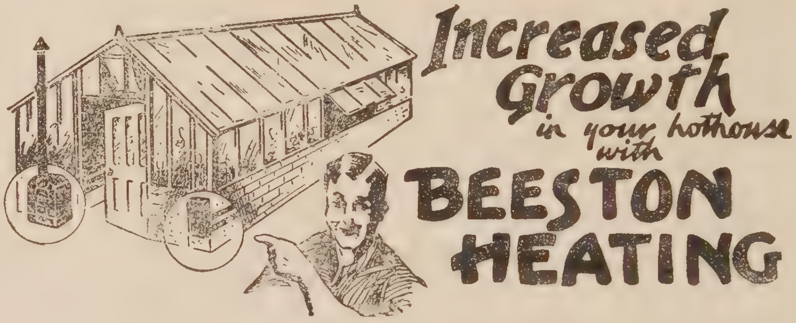

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may even allow the maintenance of some clover in the sward. However, the fear of weed invasion is as a rule too great for most farmers to follow this method. The other obvious method is the use of a nitrogenous fertiliser. Because of a lack of reliable data, together with an apparent reluctance of New Zealand farmers to use artificial nitrogen, this practice has not been widely adopted in this country.

Other Bad Effects of Dead Stubble

In addition to the exclusion of the nitrogen-supplying clovers, the accumulation of dead stubble and "bottom" has other bad effects. First is the prevention of establishment of young cocksfoot seedlings to replace the old plants if they thin out. Second is the invasion into this mat of dead bottom by the twitch grasses, mainly old man twitch (*Agropyron repens*), black twitch (*Poa pratensis*), and onion twitch (*Arrhenatherum elatius* var. *bulbosum*), all of which readily spread in such material and finally completely choke out the cocksfoot, especially if the fertility level falls. An additional complication is the presence of the cocksfoot stem-borer moth (*Glyphipteryx achyloessa*), which in recent years has received considerable attention.

The larva of this species overwinters in the stubble of the cocksfoot, and in the course of its activity can cause loss in the following crop.

The life cycle and occurrence of this moth have been studied by Avice Hamilton, of the Entomology Division of the Department of Scientific and Industrial Research, and have been reported by her in recent agricultural papers. One of the recommendations made by Miss Hamilton for the control of the moth involved the destruction by either fire, grazing, or mechanical means of the stubble left from the crop. Part of the experimental programme reported here covered the effect of such treatments on the crop itself to ascertain if such moth-prevention work is warranted.

With all the above variables it is not surprising that the production of high yields of cocksfoot seed is considered to be complex and tricky, calling for a very specialised approach.

In the July, 1948, issue of the "Journal" G. K. McPherson reviewed the cocksfoot seed industry in New Zealand and drew attention to the generally poor yields recorded in this country. Part of this he put down to the lack of precise research data covering the manuring and management of cocksfoot in New Zealand.

The trials made by the Grasslands Division of the Department of Scientific and Industrial Research have been carried out mainly in Canterbury on areas typical of the cocksfoot seed production areas of that district, but several comparative tests have also been made at Palmerston North and at Gore. Detailed results of all these trials will shortly be published, but a summary of the main conclusions is given below.

COCKSFOOT SEED PRODUCTION TRIALS

Part of a trial at Palmerston North to compare the seeding ability of different strains of cocksfoot on land with adequate soil fertility. Row cultivation methods were used in the trial. The rows on the left are of typical Akaroa strain, those in the middle are of the Grasslands Division's strain (not yet released), and those on the right are of the pedigree (C23) strain raised by Canterbury Agricultural College and at present in commercial use.

Seeding Rates and Methods

The most satisfactory seeding rate in the Canterbury trials was in agreement with that advised by McPherson in his article in the July, 1948, issue of the "Journal"; that is, 6 to 8lb. drilled or 12 to 16lb. broadcast per acre. These seedings gave the best over-all seed yield in the pure sowings. The addition of 2lb. of white clover (pedigree strain) gave a very considerable increase, probably resulting from the nitrogen build-up from the clover plants. However, this effect lasted for only two seasons, after which most of the clover had been suppressed by the cocksfoot sward. Sowing in rows with subsequent cultivation between the rows gave the cleanest stand of cocksfoot and also enabled a light seed crop to be taken a season earlier. This kept the weeds in check and also apparently stimulated the soil nutrient supply and gave correct light conditions for the cocksfoot plants. Such a practice, however, entailed extra expense of cultivations, but the trials do not give reliable cost data for farm-scale practice. With suitable machinery and on a large scale the results would probably be more favourable to this method.

In mixed sowings of cocksfoot with various cover crops the most effective combination was that of sowing the cocksfoot in spring under winter wheat. This gives a crop of wheat as well as suppressing the weed growth so common in pure sowings of cocksfoot, which is very slow to establish and thus unable to compete with the weeds in its early life. With the wheat, however, care has to be taken not to go to the other extreme of choking out the cocksfoot by the wheat. A light dressing of a nitrogenous fertiliser to the cocksfoot plants after harvest of the wheat is of great value in stimulating the cocksfoot plants after their period under the vigorous wheat.

Other trials included sowing with short-lived ryegrasses and under careful grazing. Though these gave excellent stands of cocksfoot, the disadvantage of the risk of continued ryegrass seed impurity will probably rule this out with most growers.

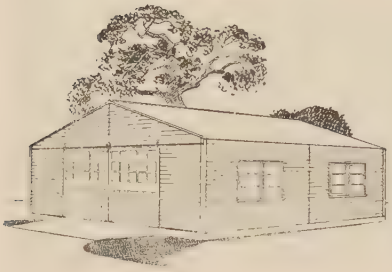
Time of Harvest

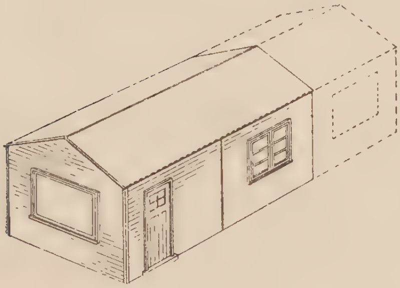
Several trials were made by daily cuttings and measurement to determine the best time to harvest the crop. By comparisons of these figures with opinions from many credited practical experts it appears that the usual judgment is about a week later than the best time. Many growers also do not appreciate the need to start as early as possible to complete the harvest before too much has dropped to the ground. It would certainly appear to be sound for most growers to start cutting several days before they usually consider the crop is ready. A large loss of seed can result from waiting these last few days until the crop is absolutely "ready," especially if the area is large. Also to be considered are the possibilities of bad weather and, of course, the usual machinery troubles.

Strain Comparisons

Over all the trials at Lincoln, Gore, and Palmerston North there has been no consistent difference in seed yield between the C23 strain, the Akaroa blends, and the latest-bred material (not yet released) of the Grasslands Division. This conflicts with the current view of farmers that the C23 strain is not such a good seed producer as the Akaroa strain. However, nearly all the Division's trials of these strains were made under high soil-fertility conditions and all strains produced high yields of seed. In one trial, how-

PREFABRICATED BUILDINGS





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high yields of seed. In one trial, however, at Lincoln, where soil conditions and total seed yields were not high, the Akaroa strain produced significantly higher yields than the C23 strain. The C23 strain is essentially a leafy plant.

Overseas work on the seed-producing abilities of certain English strains of cocksfoot has shown that in general the leafy strains are relatively poor seed producers at low fertility levels, but show a relatively greater improvement in performance compared with the more stemmy types as fertility increases. Thus it could be that present farming opinion on the seeding abilities of C23 and Akaroa has developed from a comparison of both strains grown under poor soil-fertility conditions. Both from a study of paddocks in the field and of average seed yields one would certainly feel that such is the position.

Manurial Trials at Lincoln

The first of the Division's manurial trials was a small plot trial sown at Lincoln in 1940 by J. P. Lambert and carried on since 1941 by W. G. Thurston. Although there were other treatments involving grazing, burning, and differences in mixtures, the only reliable result from the five harvestings from these plots is the strong response to artificial nitrogen. In the trial this was applied as sulphate of ammonia at the rate of 2cwt. per acre per year. The average increase from this was just over 100 per cent. of dressed seed, this increase being brought about by a greater number of seed-bearing tillers per plant as well as a greater weight of seed per seed stalk. In addition, it was found that extra dressings of sulphate of ammonia at the rate of 1 to 2cwt. applied in early October gave better results than autumn dressings alone.

In this trial the results from applying superphosphate showed that its use was not warranted. It should be remembered, however, that the trial was sown down on land to which a fairly liberal amount of phosphate and lime had been applied in previous years. Later trials made at the Lincoln station have shown results very similar to those of this early series of plots. Other trials at Lincoln involving either the use of white clover or of cultivation confirm the conviction that nitrogen supply is the greatest limiting factor in the production of high seed yields.

Two of the Eiffelton plots in a year when tares were prominent in some treatments. The plot on the right was topdressed with superphosphate and that on the left was topdressed with sulphate of ammonia.

Eiffelton Trial

All the trials mentioned so far were made on specially sown areas and the results therefore apply more particularly to new stands of cocksfoot on land where no particular treatment has been given the land in order to build soil fertility. The trial at Eiffelton was made on a 10-year-old pasture the yield of which had deteriorated considerably from the high production of its earlier years. The work was undertaken on the property of Mr. G. E. Moore, who also gave very considerable assistance in the project, which was carried out by the writer and W. G. Thurston and his staff of the Lincoln Grasslands Sub-station.

This trial was established largely to measure the effects on seed yield of practices recommended to reduce the population of stem-borer moth. Such control recommendation consists of eliminating the stubble in the field either by fire or mechanical methods. It was also felt that such elimination of stubble and bottom by fire may produce the added advantages of letting more light into the crown of the cocksfoot plant so that it would produce more seeding tillers; allowing establishment of cocksfoot seedlings from shed seed; and reducing the amount of invasion by twitch grasses. The possible danger of ryegrass and other weed invasion was also appreciated. The trial was therefore laid out with four of the possible treatments to this end. These are:—

1. Burning off the area in autumn directly after harvest (March-April).
2. Cutting the stubble off with the mower set low and then harrowing and raking off and removing the cut material and the dead bottom brought up by the harrows directly after harvest (March-April).
3. Burning off the area in spring (September).
4. Control—no treatment.

Manurial Treatments

In combination with the above treatments the following manurial treatments were applied:—

1. Sulphate of ammonia, 1cwt. in autumn, plus 2cwt. in spring.
2. Superphosphate at 2cwt. per acre in autumn.
3. Sulphate of ammonia plus superphosphate; rates as for 1 and 2.
4. Control—no fertiliser.

The size and layout of the area allowed the use of farm machinery for harvesting and manuring and for the burning and mechanical treatments. Each treatment was replicated four times. The fertilisers were applied each year, but the mechanical treatments were made every other year, this being considered the most reasonable in practice. Harvesting was done with a power binder, the seed being dressed out on a stationary mill after a suitable time for drying in the stook. The field-dressed seed was dressed to a bushel weight of 17 to 22lb., and this dressed seed was then submitted to the Government Seed-testing Station for official purity and germination tests.

In the table on this page are shown net results of the trial for the total 5-year period 1945-49.

AVERAGE ANNUAL YIELDS AND QUALITY OF COCKSFOOT SEED FOR 5-YEAR PERIOD 1945-49 IN TRIAL AT EIFFELTON

Item	Treatment	Sulphate of ammonia	Superphosphate	Sulphate of ammonia + superphosphate	Control—no fertiliser
Weight of seed off mill in lb. per acre	Autumn burn	388	207	403	177
	Autumn clean-up	378	213	433	167
	Spring burn	405	275	438	229
	Control — no treatment	485	309	471	314
Percentage of clean seed (18lb. per bushel) in material off mill	Autumn burn	63	48	63	46
	Autumn clean-up	61	47	62	46
	Spring burn	65	59	65	58
	Control	64	57	63	58
Weight of dressed seed in lb. per acre	Autumn burn	245	124	260	104
	Autumn clean-up	246	125	277	97
	Spring burn	269	161	292	118
	Control	317	175	304	181
Pure germinating seed as percentage of dressed seed	Autumn burn	80	73	82	75
	Autumn clean-up	79	73	81	73
	Spring burn	82	72	82	74
	Control	80	74	81	74
Weight of pure germinating seed in lb. per acre	Autumn burn	196	97	208	81
	Autumn clean-up	192	95	218	74
	Spring burn	221	130	241	110
	Control	256	129	246	137

COCKSFOOT SEED PRODUCTION TRIALS . . .

The table is divided into five subsections as follows:—

1. The gross weight of seed as produced off the threshing mill (field dressed).

2. The percentages of the above when cleaned to a bushel weight of 18lb. to the bushel. There was considerable variation in this respect because of impurity by tares in some of the treatments.

3. The actual yields per acre of the dressed seed after ordinary machine dressing.

4. The percentages of pure germinating seed in the dressed seed. This percentage depends, of course, on both the purity and the germination of the lines. Actually there were no real differences in the germinations of any of the treatments, and the main variability is due to the purity of the seed.

5. This section shows the final calculation of the results expressed as the per acre yield of pure germinating cocksfoot seed.

Growers will readily appreciate that what is wanted in practice is a response that is payable. It is quite possible to get an experimental response that, although quite significant in the experimental sense, is still not economic for normal farm practice. Thus what is required in these trials is a response that will repay the expense of the manure or mechanical treatment either in greater seed yields or in better harvesting conditions. As can be seen from the data, the use of sulphate of ammonia has given good results from both these aspects.

No measurement of cocksfoot stem-borer damage or of incidence of moth attack was made in these field trials. The results as set out in the table on page 383 show merely the net result in terms of seed yields.

Increased Yield Through Nitrogen

Results of the trial can best be considered by a careful examination of the data in the table. The outstanding result has been an increase in the seed yield of just on 100 per cent. through the use of the nitrogenous fertiliser. However, this is not the only advantage. The other obvious one has been the production of a much cleaner sample off the mill because of the suppression of weeds, especially tares. Superphosphate has not given any increase of significance either at the higher nitrogen level or where the nitrogen was not applied.

The mechanical sward treatments show considerable differences. This is especially so where **no** nitrogen was applied. Both burning and clearing off the stubble in the autumn opened up the sward considerably and allowed the establishment of tares in considerable quantity. Burning off in the spring weakened the cocksfoot plants visibly much more than did the autumn burn. On the other hand, the spring burn checked tare growth; the net effect of this treatment was a weak but clean sward of cocksfoot.

The best treatment of all these mechanical operations was the nil treatment; that is, to leave the sward alone and take a chance on the depredations of the stem-borer.

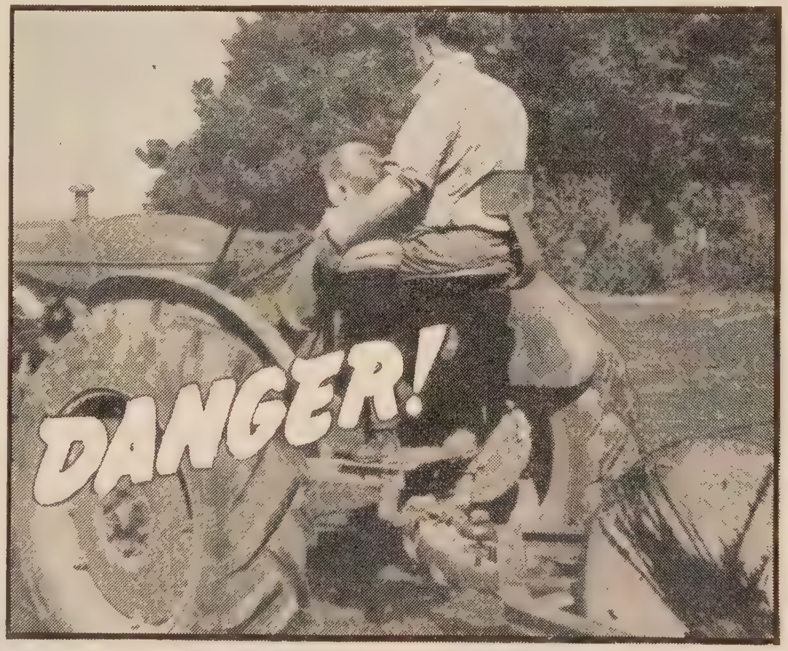
The severity of the autumn or spring opening up of the bottom was much reduced when nitrogen was applied because of the much faster recovery of the cocksfoot plants when given this fertiliser treatment. When combined with superphosphate the autumn opening-up treatments resulted in much more vigorous competition from tares in the crop following the opening up (that is, every second year). However, in the alternate years the yield of these plots increased a little, probably due to a carry-over effect from the nitrogen fixing of the tares in the previous season.

The main result of the trial has been to show a significant and payable response from the use of sulphate of ammonia at 3cwt. per acre. It is of interest to record that not only did this added nitrogen give a direct increase in seed yield and quality, but also resulted in a much cleaner bottom and fewer weeds, probably because of the greater rapidity of decomposition of the bottom flag when nitrogen was used.

The trials indicate that the use of sulphate of ammonia for cockfoot seed production in normal New Zealand conditions is a sound economic proposition. If it is considered on total seed yield alone, growers will readily appreciate the considerable net profit involved if the average price of seed and of fertiliser over the past five years is taken as a basis. Future prices are, of course, not easy to predict, but there seems to be a considerable margin of profit even if both these items go against the grower.

However, on top of this there is to be considered the extra value of a clean crop both in the cutting and in the dressing.

As has been amply shown in the trials, the use of superphosphate does not appear to offer as useful an investment, at least on those soils not showing obvious phosphate deficiency for seed production purposes. Indeed, the use of superphosphate should be watched very carefully because of its effect in weed encouragement. Similar care should be exercised in planning any burning or opening up of the cocksfoot sward bottom either as a means of rejuvenation of the cocksfoot or as a means of cocksfoot moth control.



THOUGH children of the present generation are growing up in a mechanical age and therefore are as much at home with machines as those of the older generation were with horses, in the presence of machinery there is always danger of an accident that may cause the loss of a life. Farm children think no more of riding on tractors and implements than their city cousins do of riding on trams, and in most cases they are safe. However, in an emergency a tractor driver is too engrossed in controlling his machine to take care of a child riding with him. The child does not appreciate the gravity of what is happening and has not the strength to protect himself from impending danger. Last year at least one year-old child was killed by falling from a tractor that was being driven by the father.

—C. J. CROSBIE, Farm Machinery Instructor,
Department of Agriculture, Christchurch.

Household Poultry: First-year Hens for Winter Eggs

A HOUSEHOLDER who has neglected to buy pullets earlier in the season to replace all or part of a flock which is now in a moult faces a period during which few if any eggs can be expected for 8 to 12 weeks. To make the situation worse, this period coincides with the winter egg shortage. Proper planning would have obviated this position, but even at this stage late-hatched pullets on the point of beginning to lay can be bought. In this month's article W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, questions whether buying expensive pullets is economic and suggests instead buying good-quality first-year hens from a dependable source.

[*Fraser Niederer photo.*

Portion of a poultry mart where birds of differing ages, types, and breeds are being offered. They are caged in small lots but not graded according to possible laying ability.

THE backyard poultry keeper looks at egg-production costs in a different light from a commercial farmer, who expects and requires eggs of a greater value than the total cost of rearing the pullet to maturity, feeding it for the laying year, and allowance for labour and incidental farm expenses. Householders should run poultry on the same business-like lines, but many are contented if adequate eggs are laid for current domestic requirements, irrespective of costs. In one way that does not matter, because to such people profit is not important; the primary consideration is an adequate supply of fresh eggs for the household, and their pride does not suffer when they know that the production costs of their eggs exceed shop prices.

The efficient household poultry keeper need not pay dearly for home production of eggs. Proper management and forethought will cut costs to about two-thirds of the price of shop eggs or even less.

Three Classes of Pullets Available

The careful, far-sighted householder has bought his chickens or perching pullets long before now. Newly hatched chickens can be bought this month, but they will not begin to lay until next spring and will do nothing to assist the winter egg position. Young pullets can also still be bought, but they will fall within three classes:—

Pullets 4 months old or younger. These are rather late hatched, probably reared on "stale" runs, likely to be lacking in stamina, and possibly not economic. An inspection of the seller's farm and stock will show whether it is advisable to risk buying them. However, it is not easy for the amateur to distinguish between an average 4-months-old pullet and a backward 6-months bird.

Culls. At present these can be of any age between 3 and 7 or even 8 months. They were culled out by the rearer because he considered them unlikely to develop into good-grade layers. Kept by a farmer in large lots, they would be bullied continually by their stronger flock mates and would never be profitable; bought and housed in small lots, they might prove quite reasonable layers, even if they take longer than average to grow to maturity. Buying culls is inadvisable, but if it is necessary to do so, they should be bought only on the recommendation of a knowledgeable friend. Even then the price should be taken well into account and no fancy figure paid.

Pullets at or near the lay. If laying birds are bought, the travelling, the change of housing, and the alteration in diet almost certainly will put them into a moult and off the lay. At this time of the year much the safest, though most expensive, method of obtaining pullets is to buy directly from a commercial farm birds that are on the point of beginning to lay. As these will cost about £1 each, the price plus feeding costs will preclude them from paying their way.

First-year Hens More Economic

If saving cost is important or an element of pride in good and economic management, obtaining first-year hens from a dependable source is better than buying expensive pullets. A first-year hen is one that has just completed the pullet year and has begun or completed its moult. It will not come back to the lay until the moult is finished, so eggs cannot be expected before the end of June.

Poultry marts are not dependable sources of good-type laying hens. The markets are used by farmers chiefly for quitting cull birds, mainly suitable for killing for eating. Some excellent fowls are sent to the marts, but few if any markets grade the birds by quality before sale. Sometimes they are graded by weight and size, but that is to assist the poulterer and not the householder. If the mart does grade properly hens which have been guaranteed by the client sending them for sale as first-year hens, or if the buyer has sufficient knowledge to select his own birds, they can be bought without knowing anything about their history, but as a rule buying hens from a commercial farmer is safer. If he is told what is wanted, the choice may be left to him because, if he values his reputation and wants customers to return year after year, it is good business on his part to supply high quality for price.

As first-year hens cost only about a quarter of the price of near-laying pullets, they can scarcely fail to pay their way even under indifferent management.

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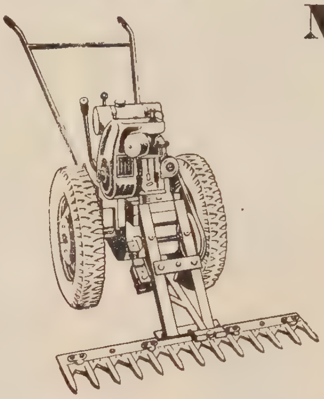

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Breeding and Management of Hoggets

PRACTICE ON WEST OTAGO FARM

By C. A. MARTIN, Inspector of Stock, Department of Agriculture, Tapanui.

WHEN breeding ewe hoggets it is surely the aim of every farmer to breed really good sheep with a minimum of loss while they are on feed during winter, and yet there are surprisingly few farmers who achieve this objective. In west Otago the number of hoggets lost annually is a variable factor, the losses ranging from the odd one or two to as high as 7 to 8 per cent. in some flocks.

SOME west Otago farmers do breed excellent hoggets with a minimum of losses while they are on winter feed. During 1949 a hogget competition was conducted in west Otago, the winner being Mr. D. D. Alderton, of Greenvale, with a flock of 250 excellent hoggets. The same hoggets gained third prize in the eastern Southland competition, only three-quarters of a point separating the first and third prize-winners. This flock of hoggets was an outstanding one and during the winter only one hogget had been lost.

Mr. Alderton's farm of 584 acres is in the Kelso-Greenvale district in west Otago, which is good, undulating, hilly country and ideal for sheep farming. Although he has been farming this property for only four seasons, figures prove that his methods are definitely beneficial. During the 1945-46 season, when 113 acres were under cultivation, the farm produced 9678lb. of wool and 20,839lb. of fat lamb; in 1948-49, when 186 acres were cultivated, the figures were 13,326lb. of wool and 26,054lb. of fat lamb.

The reason for Mr. Alderton's success in the breeding and rearing of hoggets is found in his wise planning, excellent management, and rigid adherence to his three slogans for hogget rearing: Breed right; keep healthy; feed right.

All farmers may not agree with the following methods of breeding and management, but they have definitely given results and are therefore worthy of consideration.

Breeding

The first essential of good breeding is to buy good-quality and good-type rams. The rams used are Romneys which not only are selected for constitution and character, but, most important, they are a type of Romney most suited for the class of land farmed. By this is meant that a strong-woolled ram should be used on heavy land and finer-woolled rams, but not too fine, as the land lightens.

All ewes on this farm, which are crossbred sheep, are culled for quality and not for age, for a good old ewe, provided she is healthy and has had her normal complement of lambs, is better for rearing lambs than a good young ewe.

Management of Ewes and Rams

The number of mobs in which ewes are to be mated is decided and sufficient good pasture is shut up at least a month before mating time. These "flushing" paddocks, if possible, are of sufficient size to hold the sheep long enough for the other paddocks of the farm to "clean." A fortnight to 10 days before mating (not less) the ewes are drafted into the number of mobs previously decided on—2-tooths in one, the best of the main flock in the second, and the remainder in the third. Each mob is then put through the woolshed, where each ewe is cleaned sufficiently but not too widely around the tail, is eye wigged if necessary, has attention given to all feet, and is finally carefully drenched with a phenothiazine drench. The ewes are then taken immediately to the clean, flushing pasture to avoid any possibility of worm reinfestation.

The rams also are given similar careful attention at this time.

Drenching of the mature sheep is an important matter, for, although in good health and condition, they may be

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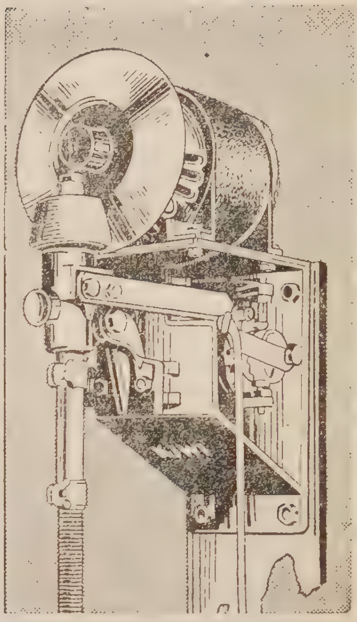

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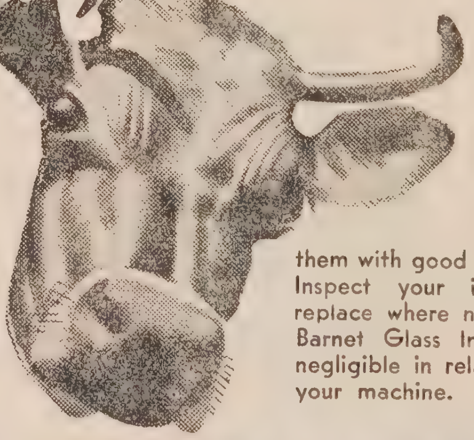

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heavily infested with internal parasites. It is these sheep which undrenched will pollute the pastures in spring, and the young and very susceptible lambs are the victims. Therefore the practice on this farm is to drench all sheep at flushing time, no matter how fat or healthy they look.

The result of this work and planning is that both ewes and rams are in as healthy a condition as possible at mating time, free from internal parasites, and free from foot-rot, while paddocks which have been spelled are available into which to move the mobs from the flushing paddocks.

Wintering of Ewes

The ewes go on to turnips, following on behind the hoggets when the feed position on the farm makes it necessary. During early winter they are rationed turnips, fed good hay, and driven off their turnip break on to a large run-off paddock daily. This normal winter-feeding process goes on until about 6 weeks before the ewes are due to begin lambing. At this time all aged ewes which have been specially marked previously are segregated from the rest of the ewe flock to receive preferential treatment. As every farmer knows, it is in aged ewes that the most ante-partum paralysis (sleepy sickness) is experienced, and mainly to prevent this the old ewes are fed specially, their feed for this period, if possible, being young grass pasture. The feeding of these ewes at this time is regulated so that they do not become too fat for lambing. At this period (6 weeks before lambing) the other ewes also receive special treatment. They have been rationed on turnips the tops of which have been eaten by the hoggets, but now they receive as many complete turnips, thus getting the green tops, and as much good hay as they will eat. At this time they are given a complete day a week, and more if possible, on good clean but not too lush pasture.

All winter the sheep have access to agricultural salt put out in boxes, and for the last 6 weeks a pot of molasses is put out beside each salt box. During the winter of 1949 the 900 ewes on the farm consumed about 5 gallons of molasses.

Lambing

It is ideal to have the ewes off turnips entirely and on to good pasture paddocks at least a week before they are due to begin lambing. About this time also 2-tooth ewes and any which do not appear to be in perfect condition are taken from the ewe flock so that they may be given special attention and treatment.

The culmination of all the management is the assurance that the lamb will be born from a healthy mother: Foot-rot is eliminated, and ante-partum paralysis is to a large extent prevented. The care and attention devoted to the ewes during autumn and winter are the greatest safeguard for lambs during their earliest and most susceptible stage to parasitic infection, as these well-drenched and healthy ewes have not been polluting the pastures to the detriment of the young lambs. A healthy, strong lamb leads to a better hogget and eventually a better sheep.

Weaning

Lambs on this farm do well on their mothers and require little attention until weaning time, which is determined by the state of the supplementary feed, and the lambs are weaned about a week before this feed becomes available. When the lambs are drafted from the ewes they are put into a paddock from which they cannot escape and the ewes are taken as far away as possible. No contact can be made between ewes and lambs, and the result is that the lambs are forced to settle down quickly with a minimum check. Within a week all lambs are crutched, eye clipped, and dipped, have their feet treated, and if necessary are drenched with a phenothiazine drench. When this work is completed ewe lambs go out on to a good pasture paddock, usually the one from which hay has recently been cut and which is therefore "clean" and provides good feed. The wether lambs go on to supplementary feed such as rape in which mustard has been sown, and the cull lambs of both sexes go on to turnip tops until they are good enough to be returned to their respective mobs.

Experience has proved that the result of past management has been that no further drenching is necessary and thus a considerable monetary saving is effected and additional handling is eliminated.

Winter Feeding of Hoggets

Ewe lambs are kept on good pasture and require little attention until they go on to feed, although further crutching and eye clipping may be necessary. Careful eye clipping will allow the hogget to see properly, but unnecessary mutilation of the head character is avoided, as a good head is the crowning glory of a good hogget. At this time, too, feet are given any attention required.

If ripened second-growth rape is available after the wether lambs have been fattened, the ewe lambs are given this feed and at the same time initiated to hay feeding. Late autumn is a vital time for hoggets and at this period they are watched carefully to see that they do not "go back." Good, clean, young grass is better for hoggets than turnips, but when it is necessary they go on to turnip feed. They are shut on a good, big, and if possible dry break, and, as they are shut on, from the outset they are forced to eat the turnips. Most important of all is the provision of good-quality hay; emphasis is laid on good quality. Hay is fed out, in the breaks, in chaff feeders, slabs of hay being broken off bales and placed in the feeders so that they will fall down to the feeding tray as required. At this stage the hoggets must be encouraged to eat the hay; any mouthed or muzzled hay in the feeder is removed so that fresh hay is always available, and slabs of fresh hay are spread about on the ground in the vicinity of the feeders. The few bales of hay which are sacrificed at this time to maintain freshness, and thus palatability, pay big dividends over the following months.

From then on hogget management simplifies, as the hoggets are kept running ahead of the ewes. Each break given to the hoggets lasts them 7 days only, no more. This is consistent with the age-old axiom for the control of internal parasites in sheep, "Never allow sheep to hear church bells ring twice from the same paddock." Every endeavour is made to shift hoggets on to new breaks when the ground is reasonably dry, for if they have time to harden the ground surface by tramping before it rains, the breaks keep remarkably dry in this undulating type of country. The watchword when feeding hoggets should be constancy; never allow the hay to run out, particularly during frosty weather.

At no time are run-off paddocks provided for hoggets, and Mr. Alderton's reasons for this practice are worthy of note. A good healthy hogget which obtains all the fibre and variety necessary in the good-quality hay fed with the turnips is always active, and thus obtains plenty of exercise although confined to the turnip breaks. When running hoggets ahead of ewes as Mr. Alderton does, it is difficult to provide an exit on to a suitable paddock, and if it could be done, it would be impossible to provide a fresh run-off paddock every 7 days, that is, to each break of turnips, and therefore the risk of the reinfestation of the hoggets with internal parasites would be greatly increased.

Hoggets also have agricultural salt available at all times in boxes on the turnip breaks. Agricultural salt, which effects a monetary saving as compared with a prepared lick, is used because there is no known or suspected mineral deficiency on the farm, and Mr. Alderton considers that hoggets on turnips and provided with an unlimited supply of good meadow hay do not require anything more than agricultural salt.

An interesting observation made by this farmer, who sows one drill of Imperial Green Globe turnips to three drills of Grandmaster Swede turnips, is the manner in which hoggets consume the type of feed available and at the same time provide variety for themselves. When the hoggets go on to a break the following is the order in which the various types of turnip feed are consumed: Swede tops, soft turnip skins, swede skins, soft turnip tops, bulbs of the soft turnips, and bulbs of the swedes.

The hoggets are taken off the turnips when there is sufficient grass to support them, and this time usually coincides with the 6 weeks before lambing when the turnip tops are required for the ewes.

During winter precedence has always been given to the hoggets, but now every care and attention must be directed toward the ewes. When hoggets go off the turnips the operation is complete, the hoggets are in good condition, and the foundation is well laid for them to grow into good ewes.

During the winter feeding of 1949 Mr. Alderton lost only one hogget, and he had a flock of hoggets which was among the best in west Otago and eastern Southland. This accomplishment is certainly the result of good breeding principles, wise planning, and sound management.

Prevention of Wax Moth Damage to Bee Combs

Seasonal Notes for the Domestic Beekeeper

WAX moths cause great damage to bee combs each year and are the chief insect enemies of bees. In this month's article for the domestic beekeeper R. Goddard, Apiary Instructor, Department of Agriculture, Tauranga, describes these insects and outlines methods of controlling them.

TWO species of wax moth are established in New Zealand. These are the larger (*Galleria mellonella*) and the lesser (*Achroia grissella*). Of the two the larvae of the larger moth cause the greater damage to stored combs, and unfortunately these pests are very numerous on the east coast of the North Island and in northern areas of New Zealand.

The female adult of the larger moth is generally grey and has a wing expanse of 1¼in. and a body length of about ¾in. The lesser moth is usually about half this size. Both insects fly by night, and are not attracted to light. The eggs, which are laid generally in cracks of hive supers and bottom boards, hatch in 10 to 12 days, and it is at this stage of their life cycle that the tiny larvae move forward on their path of destruction.

The larvae of the lesser moth have individual tunnels, and although pupation usually begins in the comb, the damage is not great. However, the larger moth larvae congregate and in this manner whole supers of combs are soon ravaged. The larvae of this moth seldom attack clean combs or comb foundation, but because of their varied diet requirements they thrive particularly well on old brood combs and on combs containing pollen. The larvae, in search of food, tunnel along the midrib, leaving behind a mass of webbing and damaged combs which are not fit for further use in the hive. Before pupation each larva generally grooves out a shallow case on the ends or on the top bars of frames and on the sides of the supers, where the pupal cases are spun in rows. These pests breed prolifically and can cause widespread damage in a very short time unless stringent control measures are undertaken by the beekeeper.

Control Methods

Precautions against wax moth damage should begin this month and not when the pests are established in an apiary. Italian bees usually do not allow the wax moth to breed in their hives, but they remove the larvae as soon as they are large enough to be dealt with; unfortunately, black bees apparently take the line of least resistance and allow the depredations of these pests to go unchecked. Careless beekeeping methods encourage wax moths to breed, and if hives are neglected and become weak or queenless, they are soon invaded by these insects. If wax moths are found in large numbers in a colony, an immediate inspection should be made for American foul-brood. The hive may have been weakened by this disease and thus fallen an easy prey to the relentless moth.

The moths generally attack combs which have been stored for winter, and unless such combs are adequately protected, irreparable damage can be done. Because of the feeding habits of the larvae it is a good practice to sort combs into various classes for winter storage; that is, brood combs should be kept together, combs containing some pollen stored elsewhere, and new combs kept in separate piles.

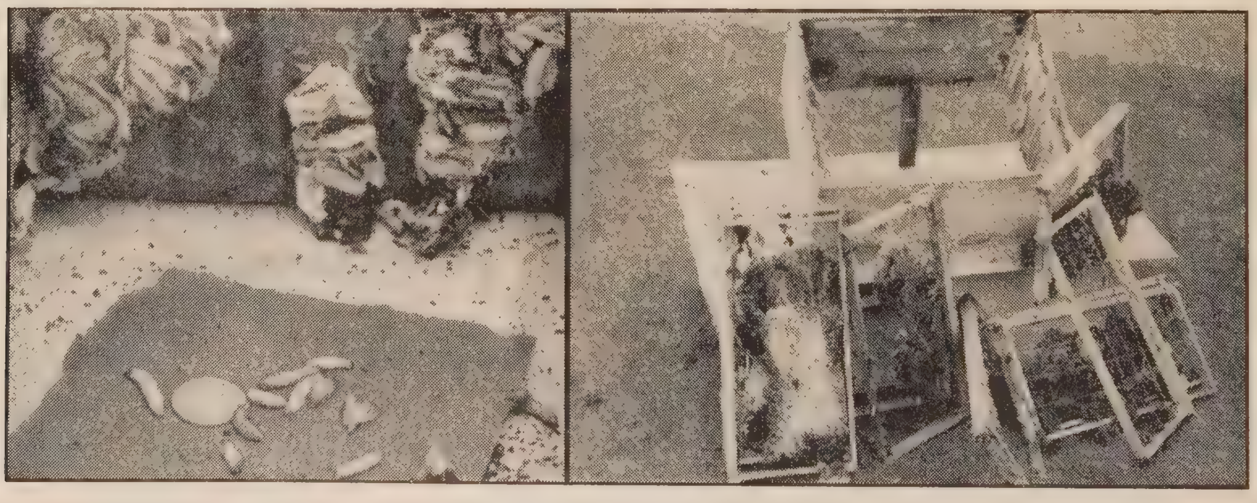
The frames in the super should be spaced as widely as possible and a sheet of newspaper placed between each super. If the moth has already laid her eggs in various supers, this method will not prevent the larvae damaging the combs, but will prevent their spread from super to super.

Use of Calcium Cyanide

Domestic beekeepers who have calcium cyanide on hand will find that it can be used effectively in wax moth control. To carry out this method the supers containing the sorted combs may be stacked on a bottom board, with a tight-fitting lid covering the top super. A tablespoon of calcium cyanide placed on a piece of cardboard and pushed under the bottom board will destroy all wax moth larvae, but is not toxic to the eggs. It is therefore necessary where wax moths are prevalent to repeat this operation about every month during the storage period to destroy all larvae hatched from the eggs since the previous application. These operations should be carried out quickly, and if the chemical is used in an outbuilding, the operator should not enter it again for at least 24 hours, and then only when all windows and doors have been opened for a period to allow adequate ventilation.

Extreme care must be taken when using calcium cyanide. It is obtainable in a fine powder or in crystal form and releases a deadly gas when exposed to air. Operators should make themselves fully conversant with the instructions issued by the manufacturers with each tin.

Careless beekeeping methods encourage wax moths, and all beekeepers should deal drastically with these enemies of bees whenever they are found.



Left—Pupal cases and larvae of larger wax moth. Right—Bee combs completely destroyed by larger wax moth.

Draining and Trenching the Flower Garden

DURING May after all the bulbs and spring-flowering plants have been planted, leaves raked up, and garden refuse removed is a good time in which to make alterations and to prepare the soil for future use. Almost all plants depend on the soil for their well-being. If the soil becomes impoverished and lacking in fertility, desirable plants cease to flourish as they should. By the use of certain fertilisers they may be stimulated into temporary growth, but the use of fertilisers without intelligent cultivation of the soil does not ensure lasting success. Every gardener should have at least a working knowledge of what is termed soil management, two important aspects of which—drainage and trenching—are dealt with in this month's article for the flower gardener by M. J. Barnett, Director of Reserves to the Christchurch City Council.

SCIENCE has played, is playing, and will continue to play a most important part in horticulture, particularly in relation to the soil and its composition, properties, and fertility, but efficient management of the soil is still an art and not a science. The experienced cultivator bred to the soil knows by intuition and experience how and when to treat it, when to manure it, when to lime it—in short, how to get the best out of the soil without impairing its fertility.

Drainage

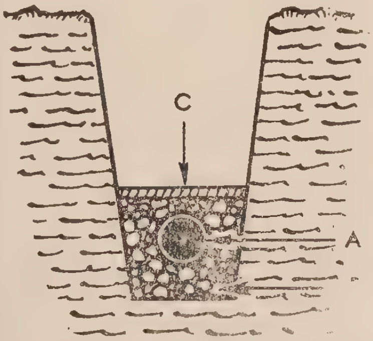
Heavy land or land that tends to become waterlogged and sour during wet periods requires draining to remove excess moisture from the soil and to allow air to filter through it, for even if the soil has all the chemical properties required, the plants will not succeed if air (soil atmosphere) is excluded.

Soil may be drained by cultivating it deeply to allow surface water to pass through it more readily or by means of field drains which carry off the surplus moisture to some outfall. Deep or subsoil cultivation is explained under "Trenching," but trenching will suffice only where the immediate subsoil is wholly or partially impervious to the passage of water; it will not remove excess water from the subsoil itself.

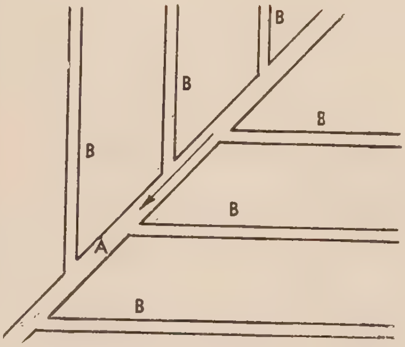
[*Douglas Elliott photo.*

Euphorbia wulfeni is a giant spurge which could hardly be called beautiful, but in the right situation it is attractive. Shrubby in appearance and growth, it has stiff, fleshy branches, each of which carries at the extremity a crown of glaucous grey foliage. As it is an evergreen, the heads of foliage are appreciated in winter, when the garden is lacking in colour. Earlier in the season the plant produces large trusses of greenish-yellow flowers that never fail to command attention. *Euphorbia wulfeni* is a hardy subject and will succeed even in a comparatively poor soil.

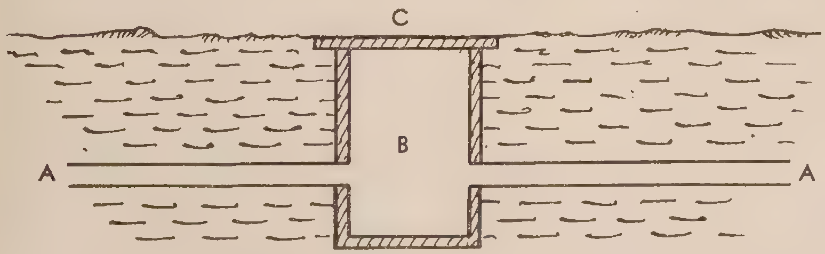
Construction of Drains



Vertical section through a drain. A—3in. drain pipe. B—Surrounding of rubble. C—Layer of straw or sacking.



Herring-bone system of drainage. A—Main drain of 4 to 6in. pipes. B—Lateral drains of 3 to 4in. pipes.



The placing of traps to collect sediment. A—Drain pipes. B—Trap. C—Cover. Such traps should be made large enough to be able to be cleaned out.

To deal with this situation unglazed earthen field pipes are laid to convey the water to a larger drain or to a point where it can be discharged without damage to the surroundings. The depth of the drain below the surface depends largely on the fall obtainable from the furthest point of the drain to the outfall or outlet. The minimum fall considered effective is ½in. in every 10ft. Thus, if the drain is 120ft. long, the top of the pipe at the start or intake should be 6in. above the top of the pipe at the outlet. On land required for cultivation the minimum depth below the surface may be considered as 2ft. so that the pipes will not be disturbed by digging.

A trench of a width at the base sufficient to enable the pipes to be laid conveniently in a straight line is opened and properly graded. A 2 or 3in. course or layer of shingle, coarse gravel, or clinker is spread along the bottom of the trench, and on this the pipes are laid closely abutting. When properly laid they are covered with a similar course of the same material and then with old sacks or straw to prevent the finer particles of soil from being washed into the drain pipes and in time choking them.

In small areas drain pipes 3in. in diameter are quite large enough, but for large areas 4in. or even 6in. pipes are also necessary; the pipes are then laid on the herring-bone principle or sometimes on the parallel system.

Where field drains must pass near trees or shrubs the pipes should be of the glazed type and securely cemented at the joints to prevent roots from entering. Roots from willows, poplars, and elms will completely fill and choke the inside of a 4in. drain-pipe in 2 to 3 years or even less.

Soils overlying some gravels and sands tend to drain out too rapidly. Loss of moisture under such circumstances can be retarded by building up the organic content of the soil with moisture-holding humus such as peat, cow manure, or well-rotted stable manure.

Trenching

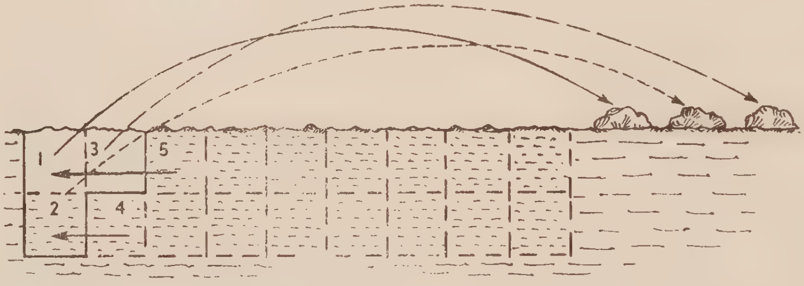
To trench an area of ground the following procedure may be adopted:—

First, open up a trench by removing the soil for a depth of 2ft.—that is, two spades deep—and 2ft. wide along the full width at the start of the plot to be cultivated. The soil thus excavated is moved to the opposite end of the plot, where the work of trenching will finish. However, care should be taken not to mix the topsoil with the lower soil or subsoil. Each lot should be tipped in a separate heap so that at the completion of the job each may be returned to its proper place.

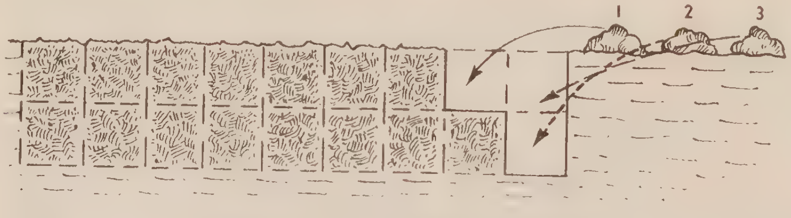
A second trench of a similar width is then opened, the topsoil again being removed to the opposite end. Then the second "spit" or subsoil is dug out and placed in the bottom of the first trench. The third trench is opened, the topsoil being placed on the subsoil removed from the second trench and the subsoil of the third trench placed in the bottom of the second, and so on throughout the whole of the task.

Throughout the work it will be found that after each lot of soil has been removed by the spade a considerable amount of loose soil is left at the base; this residue, spoken of as the "crumb," should be scooped out, a long-handled shovel being the most convenient implement for the purpose. Sometimes the subsoil may be found to resemble a hard pan which is difficult to break up with a spade, and in such cases a pick must be used.

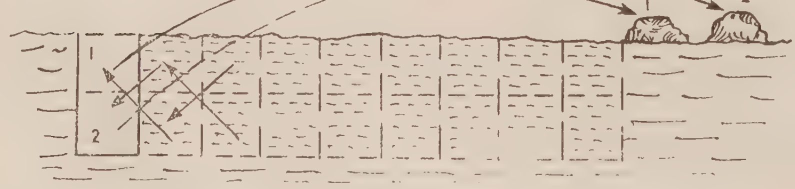
Methods of Trenching



The proper method of trenching. Soil from trenches 1, 2, and 3 is removed as shown. That from 4 is placed in 2, that from 5 in 1, and so on.



Completing the correct method of trenching.



The ordinary method of trenching, in which subsoil is brought to the surface.

Some authorities advocate bringing the subsoil or second spit directly to the surface and burying the topsoil underneath. On good, deep soils this may be done, in which case removing the topsoil from the second trench to the end of the plot is unnecessary; it may simply be turned over into the bottom of the first trench. This method is not recommended where the subsoil is almost pure clay, and obviously would be inadvisable where the subsoil consists of gravel or sand.

On new land covered with grass turf or neglected land infested with such persistent and difficult weeds as twitch grasses, it is common to remove and stack the turf and so clear the land before digging is started. Where such is the practice, the compost should be returned to the soil when the turf and weeds have decayed, and not otherwise disposed of, for one of the essentials in all good husbandary is to conserve organic matter and other materials that will add to the fertility of the soil.

A great advantage of thorough trenching is that turf and weeds can be buried during the work and the land cleared for immediate use. The procedure is to skim off the turf or surface weed-infested soil for a depth of 2 or 3in. The turves are placed on the bottom of the trench, grassy side down, and chopped up roughly with a spade to hasten decomposition. Such material when covered with about 2ft. of soil decays and adds to the humus content of the soil. Even the most persistent twitch can be disposed of in this manner. If a few pieces of roots or rhizomes are left near the surface, they can be removed readily with a fork.

During trenching opportunity should be taken to incorporate into the soil such organic manures as can be obtained from a stable, farmyard, old stack bottom, or compost heap. For most plants the manures should be placed on top of the bottom soil after it has been turned over, but for deep-rooting plants it is better placed in the bottom of the trench. When none of these or similar manures is obtainable, a general manure such as blood and bone should be scattered over the surface of the dug ground at the rate of 2oz. to the square yard and lightly forked in.

When the area to be cultivated has a pronounced slope or grade, the work of digging or trenching should be started at the upper end and continued toward the lower.

Land which has been newly trenched is necessarily left somewhat uneven and, moreover, takes some time to consolidate or settle, during which process the surface sinks in some places more than in others. An even surface conduces to better gardening and facilitates planting and sowing. If trenching is carried out during autumn, winter frosts and rain assist materially in breaking down hard lumps, aerate the soil, and improve its mechanical and physical condition. The free passage of air and rain water through the particles of soil helps to dissolve plant food and make it more available to root action.

At the first opportunity in spring when the soil is in fit condition to work—that is, not too wet or sticky on the surface—the whole area that has been trenched should be worked over with a digging fork to even the surface to one regular level or grade and to work it up to a friable tilth ready for immediate use. This is the usual and better procedure, but should the land so trenched be required for immediate use, more care is required during the initial work. Each spadeful as it is turned over must be broken up more finely, and if the soil is of a stubborn nature, the surface should be reworked with a fork.

Complete Trenching the Objective

Undoubtedly trenching as advocated is an arduous task and to the beginner a back-breaking one. The prospect of trenching the whole of the usual-sized cottage garden may raise no enthusiasm among the uninitiated, in which case all the ground should not be attempted at one time or in one year; ordinary deep digging will suffice for the time being, but thorough trenching should always be the objective. For lasting success, the whole of the garden required for production must be trenched and thoroughly cultivated, and the sooner it is done the sooner will the gardener's efforts be rewarded.

However, though deep cultivation may be delayed on land which at some period remains vacant between crops, that may not be possible with land required for permanent planting. Ground needed for the permanent planting of shrubs or herbaceous perennials which will remain indefinitely in one situation must receive thorough cultivation at the outset, otherwise sooner or later disappointment instead of pride will be the lot of the gardener.

Advantages and Disadvantages

Briefly, the advantages of deep cultivation are:—

A deeper rooting medium is provided for plants.

Drainage is assisted, as during heavy rains surplus moisture is allowed to pass through the soil and escape into the lower subsoil instead of collecting on the surface, where it saturates the soil to the exclusion of air and to the detriment of the plants.

The soil is aerated and sweetened, as moisture passing through sucks in air with it.

By the improvement of aeration and drainage, the soil temperature is improved.

The soil absorbs and retains more moisture and thus sustains plant life throughout periods of drought.

The passage of air and moisture through and among the particles of soil assists in converting the insoluble mineral constituents into soluble plant food.

The organic matter in the soil is mixed with the inorganic, thus providing a greater field in which the beneficial bacteria necessary to the life of the soil may function.

[Douglas Elliott photo.

Korean chrysanthemums are easily grown and perfectly hardy plants which produce a wealth of flowers during autumn and can always be depended on to create a display in the garden. Several named varieties on the market can be recommended. From a packet of seed from a reliable source a wide range of colours can be obtained.

Persistent weeds and garden litter can be disposed of in such a manner that, instead of being a menace, they help to improve the fertility of the soil.

The opportunity is provided to incorporate in the soil liberal quantities of organic manure should they be required for its improvement.

Against these advantages may be set the following disadvantages of deep cultivation:—

A greater demand is made on labour and time than by ordinary surface cultivation.

The land cannot be brought into immediate production as quickly as after the usual methods of cultivation.

If too much of the poorer subsoil is brought to the surface the first crops may not succeed as well as they would otherwise.

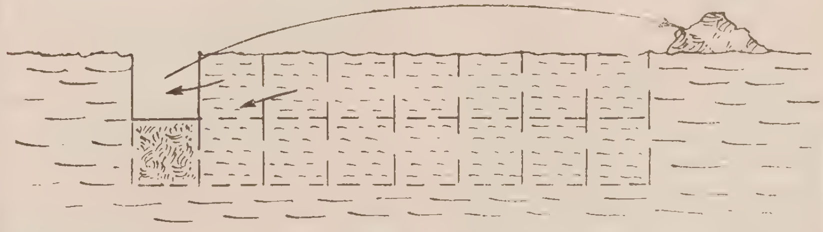
These disadvantages obviously are only temporary in their operation. The gain through deep trenching much outweighs any loss that may occur for the time being.

Double Digging

Double digging, or bastard trenching, is carried out in much the same manner as full trenching. A trench 2ft. wide and 1ft. deep is removed as before, but after the crumb has been removed the second spit or subsoil, instead of being shifted, is dug over and broken up with a spade, pick, or digging fork, the choice of implement depending on the nature of the subsoil. Opportunity should be taken during the work to incorporate a liberal amount of manure or rotted compost heap at the bottom of each trench immediately on and above the subsoil after it has been broken up.

Double digging is sometimes resorted to where time and energy do not permit proper trenching to be carried out. Its real purpose in good gardening practice is to recondition land which, during many years of constant cropping and use, has become consolidated and reached a poor mechanical condition. Such a condition often occurs in rose gardens and herbaceous borders, where, because of the impossibility of carrying out deep digging and the constant attention demanded by the plants, the soil becomes stiff, heavy, and lacking in porosity.

Double Digging



The second trench is dug over but not removed.

WORK IN THE FLOWER GARDEN

[*Douglas Elliott photo.*

Fraxinus excelsior aurea, the golden form of the common European ash, is one of the most beautiful of the deciduous trees which are conspicuous for their colouring in autumn. In the fall of the year the foliage, which has remained a light greenish yellow throughout the growing season, turns to a bright, clear, golden hue. A well-grown specimen clothed with a mass of feathery golden foliage is a sight which cannot fail to arrest the attention of everyone. In winter when the branches are leafless the golden bark appears to become more vivid and the colouring is further enhanced by the comparatively large, sooty buds at every joint along the twigs and branches. The ash has deep, spreading roots which make it unsuitable for small gardens, but where space is available it should be considered. Though perfectly hardy, it does not succeed in poor, shallow soil, but it flourishes in deep, cool soils not unduly affected by drought conditions. There is a weeping form which is more suitable for limited spaces. The golden ash is propagated by grafting it in spring on to the ordinary type raised from seed, or by budding during January and February.

Digging Over

Wherever possible all vacant ground previously under cultivation and required for future planting should be dug over systematically with a spade at this time of year. The approved method is to open up a trench a spade deep and 1ft. wide, the soil from which is removed to the point where the digging will finish. Manure such as garden litter, compost heap, or farmyard or stable manure is then spread evenly along the bottom of the trench. Should there be weeds on the surface—and usually there are—these should be skimmed off lightly and thrown in the bottom before the manure is added. However, if there are any persistent weeds such as twitch or couchgrass, these should be carefully forked out and destroyed; if buried to only a shallow depth, they will multiply rapidly by means of their underground stems and so make the job of eradicating them even more difficult.

When the second and subsequent trenches are being dug over the blade of the spade should be kept almost upright when it is driven into the ground so as to remove the greatest possible depth of soil. Each spadeful of soil as it leaves the blade should be turned upside down, so bringing the bottom soil to the surface. Some practice is needed for the beginner to become proficient in the use of the spade, but proficiency can be attained readily by regular use, by always keeping the trench clear-cut and open as the work proceeds, and by using clean, sharp tools.

Ground dug over at this time of year can be left more or less rough and open to the sweetening and pulverising influences of sun, wind, rain, and frost until spring, when it can be broken down readily to a finer tilth by the use of a fork. However, when the soil is required for immediate use each spadeful as it is turned over should be chopped up and broken down to an even and smaller texture.

Mechanical and Motorised Implements

In this mechanical age considerable use is made of such implements as the rotary hoe and rotary tiller for cultivating the soil. These are excellent machines for rapidly bringing soil to a good tilth for planting and sowing, and their use can be recommended on an extensive area where economy in time and labour is necessary. Yet, good as they are, they can cultivate at most to a depth of only 9in., and they cannot perform that deep cultivation accomplished by proper trenching.

Surface Digging or Pointing

On land occupied by more or less permanent plants deep digging is inadvisable because of the danger of injuring surface roots. In such circumstances pointing, or shallow digging, is practised when it is necessary to refresh the soil and work in fertiliser.

The procedure is to turn over the soil by driving in the blade at such an angle that it does not penetrate to a depth of more than 6in. In some cases, such as in well-established shrubberies where the roots are very close to the surface, the work is best carried out with a garden fork, the prongs of which will not injure the roots to the same extent as would the blade of a spade or shovel.

Wherever possible cultivation should be avoided when the soil is wet and sticky. Ground should be dug when the soil is going from a dry to a wet state rather than from wet to dry.

Plants to Propagate

Many evergreen shrubs such as *Acuba japonica, Azara microphylla, Garrya elliptica, Buxus sempervirens* (the common box) and its varieties, and *Euonymus japonicus* and its varieties can be propagated readily from cuttings during May. Though several of them may be struck in open ground, a surer method is to propagate them in 5in. pots plunged in a cold frame.

The cuttings to take are the short side growths of the immediate past season's growth (usually described as the current year's growth) with a short heel of the older wood. The heel is trimmed carefully and the cuttings inserted in a sandy compost in the pots. The cuttings should be firmed at their bases and the pots plunged in sawdust or cinders in a cold frame where they can be protected from rough weather and properly cared for. Light shading from bright sunlight is necessary until the cuttings have rooted.

Other Work for May

Sharp frosts may be expected at any time now and all half-hardy or frost-tender plants should be given protection when necessary. Plants in cold frames or in unheated glasshouses can be given extra protection by covering the glass with hessian or scrim at night when frosts are imminent. Should the covering become wet, it should be dried out next day, for dry material is more repellent of frost than wet material.

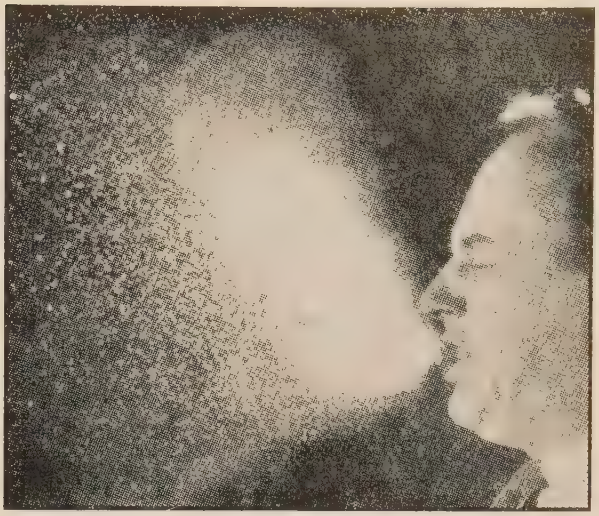
All drains and water-tables should be cleaned out in readiness for the heavy rains of winter.

Rambler roses should be pruned and the strong young growths or canes that will produce the better flowers next season securely tied in.

In milder districts it is not too late to sow down new lawns.

Infectious Diseases Need not be Spread

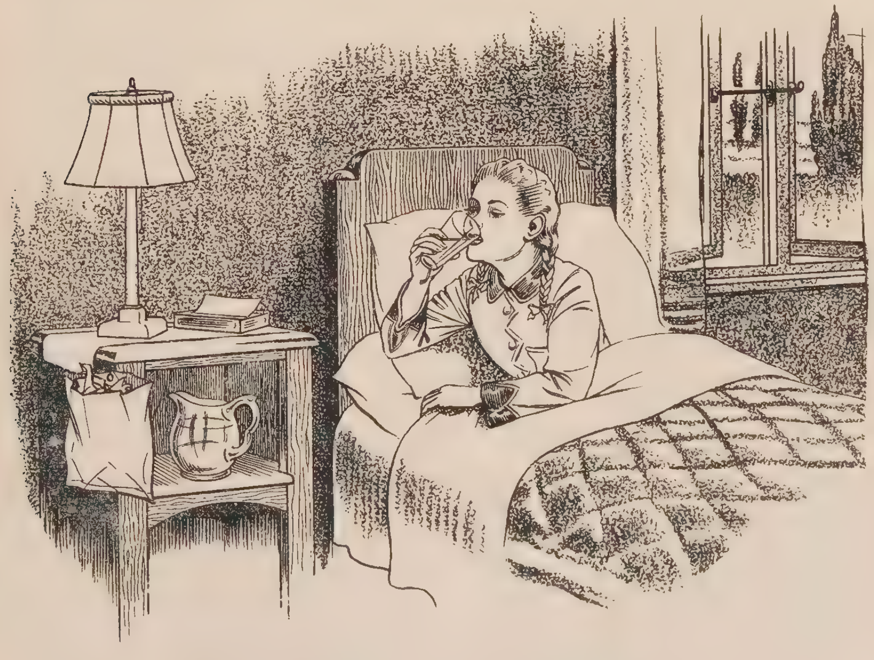
MUMPS, measles, chicken pox, whooping cough, influenza, septic sore throats, and colds are infectious diseases from one or other of which most families suffer at some time, and all too often a mild or not-so-mild epidemic spreads through a school or a district. Yet what is done to prevent this spread? For cases of the first five common diseases mentioned a doctor is usually called in when the patient obviously is really ill, but by that time the disease-carrying germs may have infected many other people. In fact, unless precautions have been taken, almost certainly they will have been spread to a great many people who need not have caught the disease, but who may then have it far more seriously than the person from whom the germs first came. This article by Eirene E. Unwin, Rural Sociologist, Department of Agriculture, Dunedin, outlines precautions that can be taken with very little extra care if a member of the family appears to have caught an infection.



INCLUSION of the common—all-too common—cold in the list may cause surprise, but in fact it is one of the worst offenders in starting an epidemic, largely because few people treat it seriously. They go about with a cold, sneezing, sniffling, coughing, and feeling miserable, because they think it sissy to go to bed or stay away from work or school with "just a cold." Yet every time they sneeze or cough, every time they hastily pull out germ-laden handkerchiefs, even every time they speak, they are spreading the invisible virus that has caused their colds. The Department of Health has stated that "colds are responsible for more lost time and efficiency in industry than probably any other single cause," yet most people still think colds are unimportant.

Checking Spread of Disease

As the rules for checking the spread of the common cold can be applied to most other infectious diseases, they are given first. Curing a cold quickly is one of the most effective ways of checking the spread of the cold germs, so the rules include treatment for the cold itself.



Hygiene in the sick room—fruit drink on hand, ample ventilation, a box of paper handkerchiefs, and a bag for soiled handkerchiefs.

First rule for checking the spread of a cold is to begin the treatment as soon as the first symptoms become apparent. A child with a cold should be kept away from other children. If other people's children have colds and are not kept at home, parents should endeavour to prevent their own children from playing with them.

Children should be taught to sneeze into their handkerchiefs on all occasions, but particularly when they have a cold or any other infection. The photograph reproduced above shows what happens when a sneeze is not smothered. Each droplet contains myriads of germs, which float off into the air as the droplet evaporates. Some germs may remain alive in air or dust for a long time, even though they become quite dried, and attack the first person breathing them in.

Particularly if the child's nose is streaming, he should use paper or rag handkerchiefs, which can be put into a paper bag after being used and burnt as soon as possible. This is important, for a handkerchief becomes thoroughly germ laden each time it is used by anybody with one of the common infectious diseases, and the next time it is pulled out hastily, perhaps to smother a sneeze, these germs are shaken off into the air to become a menace to whoever may breathe them in. Therefore it is far better not to use good handkerchiefs, but to use something that may be burnt with its load of germs after only one use. Facial tissues, paper serviettes, or soft toilet paper make good sick-room handkerchiefs.

Curing a Cold

First step toward curing a cold quickly is to put the patient to bed in a well-ventilated room, if possible after a hot bath, with a hot lemon drink containing crushed aspirins (one or two according to age). The bed should have plenty of blankets, and the child must be made to stay under them and perspire, which is all the more important if he has a high temperature.

PREVENTING AND CURING INFECTIOUS DISEASES . . .

The patient needs plenty of liquid—lemon drinks if possible, but if lemons are not available, cold water contributes to the cure. The child should be encouraged to drink as much as he will, but he should be given only light, simple foods, with plenty of fruit or fruit juices.

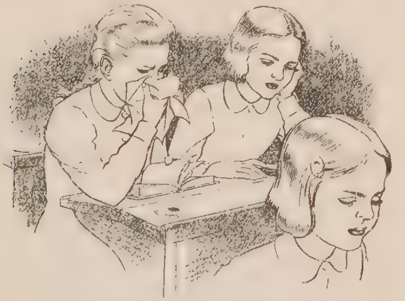
If the child is kept in bed for one or two days, either his cold should be better or, if it is not a cold but the early stages of something worse, recognisable symptoms should have developed; a doctor should then be called in to give directions about what to do next.

Benefits of Early Treatment

Treating a cold seriously right from the start is doubly valuable. One or two days spent in bed, or at least indoors with as much rest as possible, as soon as the first sniffle or sore throat appears is likely to cure it promptly and keeps the infectious person away from others so that the spread of the germ is minimised. In addition, it is the best possible treatment if the "cold" is really the first stage of some more serious illness.

On the other hand, if the cold is neglected and the sufferer attempts to go on with his work or attends school as usual, it will probably develop into a really bad cold, cause a week or two of misery, and allow only inefficient work to be done all this time. Many other people will catch the cold, and they will then also have to go through its discomfort and a period of inefficiency, while they will spread the infection still further.

If the "cold" is really the beginning of a more serious illness, early neglect probably will cause the illness to be a good deal worse than it might have been, and this more dangerous infection will also have been spread unnecessarily. Neglect of a simple cold reduces the patient's resistance to all infection, and he is more likely to succumb to the attack of any other germs with which he may come in contact. Staying in bed not only helps cure his cold as quickly as possible, but also keeps him out of the way of most other, perhaps more dangerous, germs while he is in the condition in which they can do him the most harm.



Children should be taught to sneeze into their handkerchiefs on all occasions.

Precautions with Other Diseases

Measles, scarlet fever, chicken pox, mumps, whooping cough, influenza, and diphtheria all have very similar early symptoms, so, if any of them seem to be about, a watch should be kept for headaches, sore throats, running noses or eyes, a high temperature or a general feeling of not being well, and unusual irritability in small children. Until medical advice has been sought none of these symptoms should be taken lightly. The rules given for treatment of colds should be followed, but further precautions may also be taken.

Particular care should be taken to exclude visitors. Not even pets should be allowed into the sick room, as they may carry the disease germs away with them and spread them to other members of the family. The person nursing the patient should wear a special overall while in the sick room and keep it there.

The nurse must wash her hands well in hot water and plenty of soap before leaving the room. Contaminated hands can leave germs on door handles and taps if they are washed in the bathroom, so if possible a wash basin should be kept in the sick room and hot water taken in for this and other uses whenever the nurse attends to the patient.

If any epidemic infection is diagnosed, but the patient is to be looked after at home, these rules also could well be observed, though now they are not considered quite as important as those already mentioned:—

Keep in the sick room all the utensils and articles that the patient uses, including chinaware and cutlery, toys and books, and the thermometer and other nursing equipment.

Wash his utensils in the sick room, or at least by themselves, using very hot, soapy water. The thermometer should not be washed under the kitchen tap, though it may be rinsed under the cold tap in the bathroom, but it is best wiped with a small piece of damp cloth after use before it is read and then kept standing in disinfectant until it is required again.

Burn uneaten food and used paper handkerchifs as soon as possible.

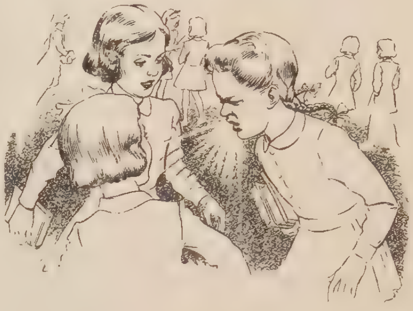
Launder the patient's clothes and bed linen separately, using plenty of hot, soapy water, rinsing them well, and, if possible, hanging them to dry in sunshine.

Keep in the room a covered jug of water, a basin, soap, towels, and a slop bucket.

Keeping Children at Home

Unless it is ordered by a doctor, keeping other children in the family away from school is not now considered necessary except in the case of scarlet fever, if it is to be nursed at home; measles, if it is an isolated case—that is, if there is not already an epidemic of it; whooping cough, unless any of the other children have already had it, when these children may go to school; diphtheria, and poliomyelitis (infantile paralysis).

Other children who usually help to milk should be kept out of the cowshed until the doctor says they may go back. Milk is an excellent food and breeding ground for germs, and infection may be spread to people who drink the milk or eat butter made from the cream if it becomes contaminated.



Smothering a sneeze is particularly important to a person with a cold or any other infection.

Immunisation

It is wise to have all babies immunised against diphtheria at 6 months of age (2 or 3 injections), and the Department of Health usually gives another "booster dose" (1 injection) when the child goes to school. This should protect him completely throughout the period when he is most susceptible and is thoroughly to be recommended.

Research into whooping cough has not yet gone far enough for immunisation against it to be completely reliable, but at least it does no harm. If a doctor recommends it, immunisation is probably wise; it may do some good.

Cleaning a Sick Room after Use

A room in which an infectious case has been nursed should be spring cleaned before it is put back into everyday use.

The mattress should be put out in bright sunshine for one or, if possible, two days, the blankets should be washed and dried in sunshine—in fact, the sun should be allowed to shine on as many as possible of the articles which may have been contaminated. Sunshine is one of the best germicides known.

Preventing Infection

The application of a few everyday, common-sense rules helps prevent infection, and they should be applied whether any particular diseases are known to be about or not:—

Train children to wash their hands always before going to a meal and after going to the lavatory.

Wash the hands before handling or preparing food.

Keep the home clean, and have it well ventilated day and night, especially bedrooms or rooms where many people are gathered.

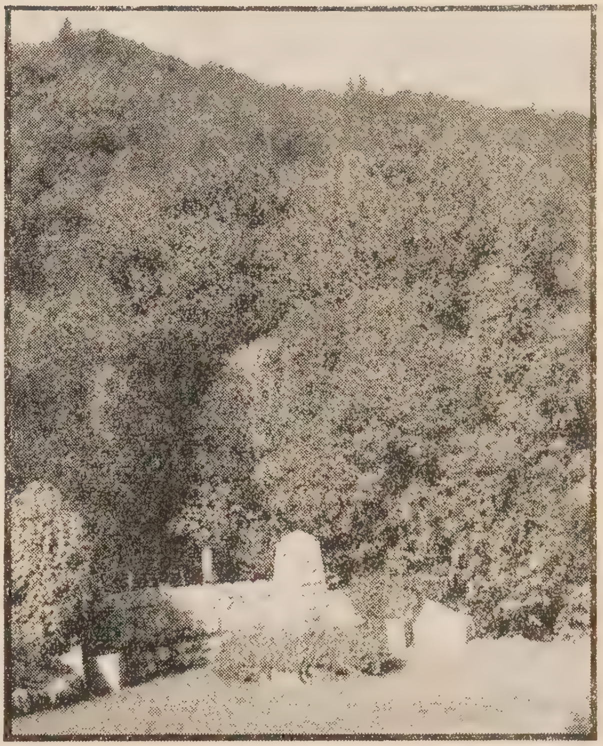
THE MUSEUMS OF NEW ZEALAND

IN the six previous articles in this series Enid B. V. Phillips described the four metropolitan museums in New Zealand and five provincial museums. This article deals with two more provincial museums, the Whangarei Museum and the Nelson Museum.

The Whangarei Museum

ONE of the first families to settle in Whańgarei was the Mairs. The father, Gilbert Mair, was no newcomer to New Zealand shores, for he put into port at Kororareka (Russell) as early as 1820, the vessel, a whaler most aptly named New Zealander, having the notable Maori chiefs Hongi and Waikato as passengers on the return trip to England. The son of a Scottish merchant, Mair had sailed on several lengthy voyages in whalers while still a young man, being possessed in a marked degree of that spirit of adventure and enterprise which makes the Scotch such excellent colonists.

Evidently the New World appealed to him, for in 1824 he left his ship in Sydney and came to New Zealand and helped the Rev. Henry Williams, a naval lieutenant during the Napoleonic Wars, build the mission ship Herald. This 60-ton schooner had been designed by the youthful missionary in his spare moments when he and his wife, who had three infants of their own to look after, were not engaged in ministering to the needs of the many women convicts in the miserable prisons below decks in the Lord Sidmouth on the long voyage to New Zealand, and was the Church Missionary Society's main means of communication between the Bay of Islands and Sydney. Williams's previous experience of warfare rendered him an excellent representative of the Church Militant when the occasion warranted, as witness his successful defence of the partially built mission schooner from destruction by a hostile band of Natives, laying about him with the first available weapon—a length of timber—to such effect that his attackers took refuge in flight. Throughout the entire proceedings he was ably seconded by Mair, who wielded a broken oar with rhythmical vigour to ward off the blows of the aggressors, albeit his left arm was broken in two places before the finish of the fray.



[G. E. Woolly photo.

The cairn in Mair Park, Whangarei, which was erected as a memorial to Robert Mair, who presented part of the family estate to the town for use as a park.

Herald's Maiden Voyage

Mair was appointed captain of the Herald, and on her maiden voyage to Sydney he was accompanied by his cobuilder, Williams, a missionary colleague, Mr. Fairburn, and Mr. and Mrs. William Puckey, their son, William Gilbert, and their daughter, Elizabeth. Mr. Puckey was a carpenter before he volunteered as a lay missionary in Tahiti, where he served subsequent to coming to New Zealand under the auspices of the London Missionary Society and assisting with the erection of Rev. Samuel Marsden's first mission buildings at Kerikeri. (The account of the Tahiti mission mentions that its workers had as their living quarters the big house which had been built for Captain Bligh of the Bounty.) He, too, had a hand in the construction of the Herald. The rough weather encountered on the trip was no hindrance to romance, however, and the following year Mair made the voyage to Sydney to bring Elizabeth back to the Bay of Islands as his bride. Incidentally, Elizabeth, who had taught in Marsden's Sunday school at Parramatta, New South Wales, before her marriage, was musically inclined and her piano, a Broadwood table grand, probably the first to be brought into New Zealand, is much prized by her granddaughter, now in her 81st year.

The young couple had been married only about 6½ months when the Herald came to grief on the bar at the entrance to Hokianga harbour, a sudden lull in the wind leaving the schooner at the mercy of the breakers, which sent her ashore. Captain Mair was lucky to escape with his life, for in his endeavour to prevent the ship and her crew from being plundered by the Natives, who intended to purchase gunpowder with the proceeds, he was knocked down and attacked by a Maori with a tomahawk and but for the prompt action of a Maori woman in throwing her mat over him he would have undoubtedly been killed.

The Mairs lived at Paihia for several years, but in 1831 they moved to Te Wahapu, where Mair set up a trading station consisting of three large stores and a wharf, reputed to be the first in the country, and made quite a name for himself as a merchant, supplying the whalers with all requisites and repairing their ships as well. He also traded with Sydney in timber, flax, and kauri gum, an undertaking in which he was partnered by William Powditch for a short time.

Gum Trade with America

It was his enterprise in showing an American whaling captain a small lump of kauri gum left on the mantelpiece by one of his children which really led to the commencement of the gum trade with that country, as his visitor straightway arranged for a shipment to be sent to America, a guaranteed price of 4d. per pound being agreed upon. The arrangement proved highly satisfactory to both parties and when the flourishing settlement at Te Wahapu needed a schoolmaster (Mair's policy in providing comfortable houses for prospective settlers resulted in a number of skilled tradesmen taking up permanent residence there) one John Fogan, "a man of very superior attainments," came from America especially to fill the position. The settlement was the first one to have a post office; this was in the charge of William Powditch, but Mair later succeeded his former partner as postmaster.

Another of Mair's concerns was the establishment of a timber mill at Ngunguru, the first in New Zealand, his partners being James Busby, the British Resident at the Bay of Islands, and Captain Lewington, who acted as manager of the mill. Possibly it was during this period that he purchased Mr. Busby's medicine chest at a cost of £16 17s. 6d.; with so large a family he certainly had plenty of use for such an article, and more than one of his descendants today recalls being dosed from that selfsame chest which is now cherished because of its interesting connection with the past rather than the remedial nature of its contents.

[*G. E. Woolly photo.*

The Mair family plot in front of Christ Church, Whangarei.

Move to Whangarei

Two years after the signing of the Treaty of Waitangi, an event at which he had been an eye witness, Mair sold his Te Wahapu interests, and he and his family, plus a cargo of 20 cows and an Arab mare and her foal, sailed aboard the schooner Harlequin for Whangarei (a trip of about 3 days), where he owned land and was afterwards granted an additional area by the Government, and began farming. He called his new property Deveron, thus commemorating his birthplace in Banffshire, Scotland. Here, in after years, he had the help of his four sons, one of whom had been born at Paihia, two at Te Wahapu, and one at Whangarei. Eventually, the second son, William Gilbert, succumbed to the lure of the Australian gold-rush and later his brother Henry likewise left home to try his luck at the diggings.

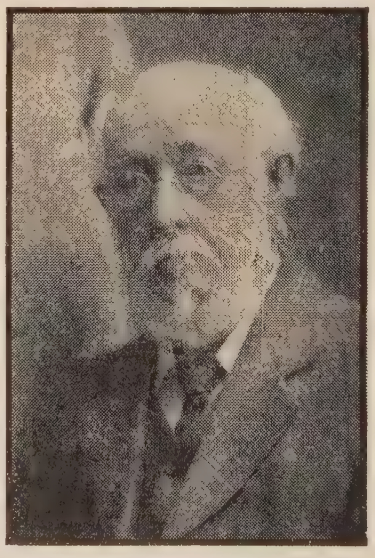
The Mair lads inherited their ability as Maori linguists from their uncle, Missioner W. G. Puckey having aided Bishop William Williams in his translation of the New Testament into Maori. William Gilbert Mair served with distinction in the Maori Wars, acting as General Cameron's envoy at the historic siege of Orakau, when the doomed defenders declined to acknowledge defeat even to save the lives of the women and children and responded to the pakeha's offer of peace, conveyed at great personal risk by Major Mair, with a challenge which will always rank as one of the world's most outstanding examples of courage: "We will fight you for ever, for ever. . . . The women will fight as well as the men. Ake! ake! ake!" The parley ended, fighting was thereupon resumed. At the close of the campaign Mair was appointed magistrate at Waikato and he did much to bring about "a good understanding" with the paramount Waikato leader, Tawhaio, and his chiefs.

An obelisk has been erected to his memory in the Mair family plot in front of Christ Church, Whangarei, the land for this church, which was dedicated in 1861, being given by his eldest brother, Robert.

Awarded the New Zealand Cross

Another son, Gilbert, articled to the Surveyor-General at Auckland, was responsible for the survey of Maori lands between the Waikato heads and Raglan, and he also proved most proficient in the Maori tongue. He was awarded the New Zealand Cross for his contribution in the wars; on one occasion he led a band of Ngati-Pikiao warriors to victory against an opposing force four times their number.

Henry Mair, too, took an active part in military affairs, and the original record of the members of the militia and the pistol belonging to the notorious chief Te Kooti, whom they had so often pursued, are among his brother Robert's gift of shells, stone adzes, a mere onewa, etc., which gave the Whangarei Museum its start in the 1890's. (Furthermore, Robert Mair presented the town with the beautiful park which bears his name and which was formerly part of the family estate.) Unfortunately, the remainder of his remarkably fine private collection, which doubtless would have been donated to the museum, was lost in the disastrous fire that destroyed his home about 1913.



Robert Mair, whose gift from his private collection formed the nucleus of the Whangarei Museum.

The museum has a good collection of kauri gum, as befits a district where this commodity was once a rich source of revenue, and another exhibit typical of the locality is an immense broadbill swordfish which weighs 560lb. In the Polynesian section there are several artistically patterned lengths of tapa cloth, a trio of decorative pieces of pottery from Fiji, and a whalebone walking stick ornamented with scrimshaw work.

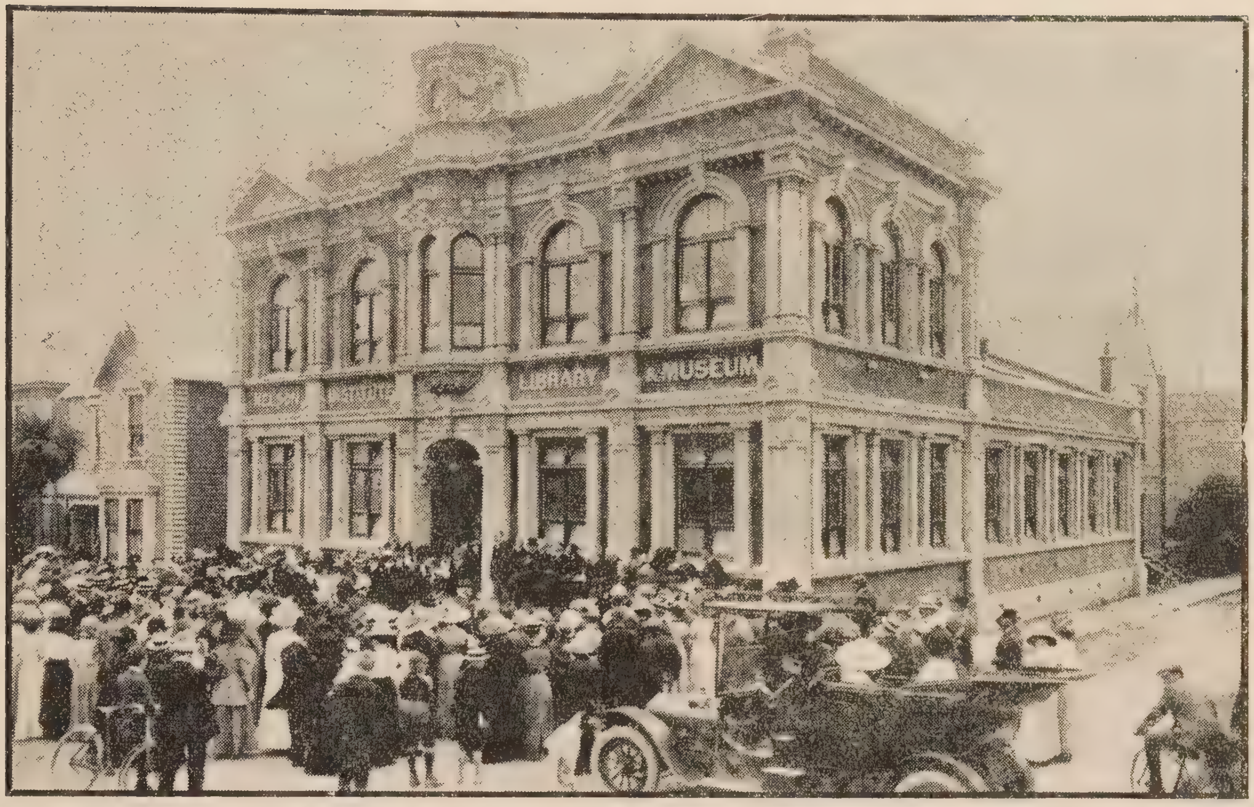
Collection of Minerals

Included in the collection received from Miss A. Goldie is the carved prow of a Maori canoe and a delicately lacquered Japanese cabinet. Probably the most valuable and interesting exhibit to students is the comprehensive collection of minerals, fully labelled and annotated, given in 1941 by the late W. A. Given, science master at Whangarei High School.

The administration of the museum (which occupied a room in the town hall) was in the hands of the library committee of the borough council staff, and at one stage W. M. Fraser, engineer - secretary to the harbour board, acted as honorary curator (Mr. Fraser being a collector of repute, particularly of Maori artifacts), an office which was subsequently held by the librarian, Miss Bain, for several years. Since 1941 Mrs. W. Reynolds has been in charge and has done much to build up the exhibits, borrowing from the extensive loan resources of the Auckland War Memorial Museum for this purpose. The Whangarei Museum is is now in recess owing to lack of suitable housing, but the townsfolk confidently predict that in a few years time a suitable building will be erected and they will be able to establish a truly local museum representative of the history of the district.

Nelson Museum

Nelson has the distinction of possessing a museum which was planned on board ship long before the sponsors ever set foot in Aotearoa, Land of the Long White Cloud. Edward Gibbon Wakefield, having successfully accomplished the founding of Wellington, now turned his attention to establishing an even larger settlement in the South Island in the district adjoining Banks Peninsula. However, Governor Hobson withheld the requisite permission, and it was necessary to choose suitable land elsewhere. Blind Bay (so called by Captain Cook), which is bounded by the biggest stretch of sheltered water on the South Island coast, was selected for the site of the proposed settlement to be known as Nelson.



[*From the Alexander Turnbull Library photograph collection.*

Opening of the Nelson Institute's third building on November 27, 1912, by the Hon. F. H. D. Bell, Minister for Internal Affairs.

Early Decision to Found Institute

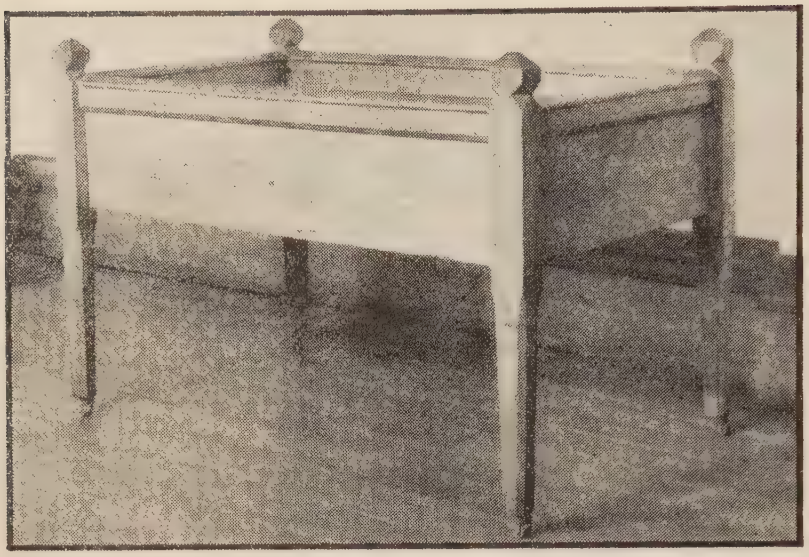
The first of the new settlers sailed from England in the ships Will Watch, Arrow, and Whitby, under the leadership of Edward Wakefield's brother Captain Arthur Wakefield, R.N., and the scheme to found the Nelson Institute, which included a public library and newspaper reading room, a museum, and a philosophical society, is attributed to those on the Whitby. Agreement had been reached even before the vessel reached Teneriffe, and details were sent back to London to the New Zealand Company, who promptly began the collection of books and museum exhibits.

Meanwhile, Captain Wakefield, having brought his party safely to Wellington in the spring of 1841, left for Astrolabe (north of Motueka). (Astrolabe was named after the corvette of Captain Dumont D'Urville, of the French Navy, who visited the bay in January, 1827, on his voyage round the world, and departed via French Pass, which he had the honour of discovering, damaging his ship slightly on the reef. The passage took 5 days to accomplish and is described as one of the most dangerous feats of early New Zealand seamanship. This cultured geographer, whose somewhat lengthy appellation caused him to dispense with his first three Christian names, Jules Sebastien Cesar, in favour of the fourth, conducted his explorations of New Zealand's rugged bush country clad in full dress uniform; he greatly admired the Maoris and likened their native land to "the fair isles of the Aegean Sea". It was D'Urville who found the Venus de Milo lying amid a pile of broken masonry in Greece and acquired it for the French Government; that is how the Louvre, the vast museum of art and antiquities, came into possession of the famous statue.) On October 20, 1841, the discovery of Nelson Haven, so favourably situated behind its protective Boulder Bank of hornblende granite, resulted in its choice as the future township, and the first emigrant ships arrived in February of the following year.

Captain Wakefield himself headed the museum committee, and associated with him were the stalwart Frederick Tuckett, chief surveyor to the Nelson settlement (in 1844 he carried out an exploration of Otago and Southland preparatory to the founding of the New Edinburgh settlement); W. Curling Young, J.P., immigration agent for the New Zealand Company, whose duties consisted chiefly of keeping the accounts and welcoming the immigrants on arrival and helping them to settle (the diary of his own voyage to New Zealand aboard the Mary Jane is intensely interesting), but whose good work was cut short abruptly through his untimely death by drowning in the Wairoa River; Alfred Domett, gifted writer of prose and poetry, who later became editor of the "Nelson Examiner" and who took a prominent part in provincial politics; and George Duppa, whose older brother Bryan, although he originally suggested the formation of the Nelson Company and was a member of the first Nelson Institute Committee, set up in London in 1841, never set foot in New Zealand. George, however, "a handsome dark-eyed man like a Spaniard in face and descended from Bishop Duppa of Charles II's time," came in his stead and by 1844 was running 200 head of cattle and 700 sheep on unoccupied land in the Waiiti Valley, Nelson, and in 1851 purchased 8000 acres at Birch Hill. He proved to be one of Marlborough's most successful squatters.

Important Educational Function

The library and reading room were opened on September 27, 1842, the institute catering for the settlers' educational requirements by means of lectures, courses in reading, and classes on various subjects. Philosophical studies and the study of museum material were regarded as advanced education. (The institute has continued to fulfil an important educational function in the community for over a century, and of late years has specialised in lectures on local history and social studies, illustrated by museum exhibits, to both the primary and secondary schools of the town.)



[A. R. Kingsford photo.

The wooden cot made for Lord Rutherford by his father and which is now an exhibit in the Nelson Museum.

Unfortunately a dispute with the Maoris over the sale of land at Wairau in 1843 led to an affray in which Captain Wakefield and a number of leading colonists lost their lives. Frederick Tuckett was appointed Acting-Resident after Wakefield's death, Alfred Domett being another well-known landowner who "shouldered a rifle" in the Nelson Militia at this time. The Nelson residents at once began to fortify the strategic Church Hill, and a model of this fort and also the site of the Wairau massacre at Tuamarina may be seen in the Nelson Museum today. Arthur Wakefield's letters to his brother are among the archives of Canterbury Museum.

The museum received official status through the passing of the Nelson Institution Act in 1859, a second institute building where the exhibits could be adequately displayed being opened in 1861. This was partially destroyed by fire in 1906, but it was rebuilt and has continued to house the library, which now numbers 30,000 volumes, and the museum ever since. Under the original organisation the librarian was also the curator of the museum and it was not until 1935 that the two positions were made separate, and Lieutenant-Colonel C. B. Brereton was appointed curator, which office he still retains. His "History of the Nelson Institute" was published recently and is meeting with an appreciative reception from the reading public.

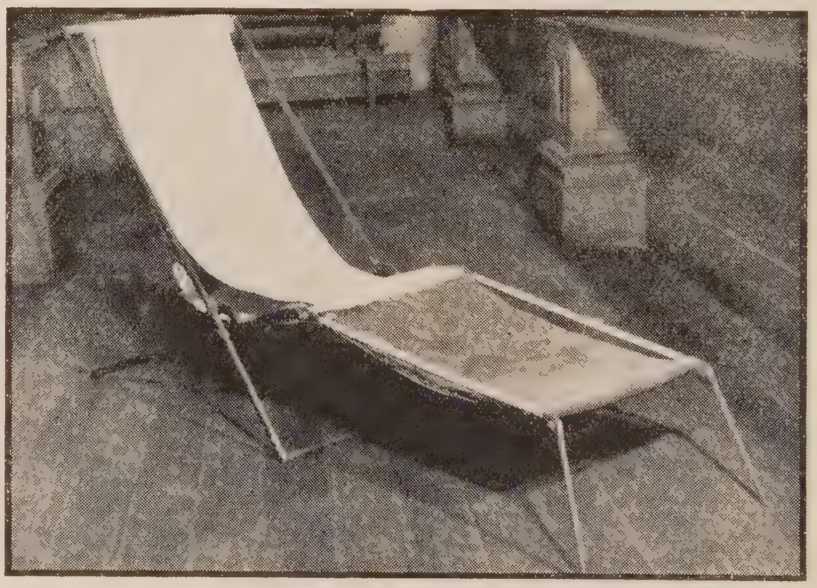
Lord Rutherford's Cot

The show piece of the museum is a wooden cot made by a Brightwater wheelwright and farmer for his baby son Ernest, who became one of the most brilliant scientists of his time, a Nobel Prize winner upon whom a score of noted universities bestowed honorary degrees and whose pioneer researches into radio-activity and the structure of the atom made the name of Rutherford renowned throughout the scientific world. By a strange coincidence the museum's memento of a man famous in another walk of life is also to do with his place of repose, the article being the folding bed used by Bishop Selwyn on his travels through the country. It is made after the style of a deck chair with a heavy iron frame and a foot-rest and can be converted into either a chair or a bed. Some of the original canvas cover with its fibre filling still remains and, despite its continual use by the owner, it is nearly as good as new. The same degree of high-class workmanship is apparent in the case of "razor-sharp" surgical instruments which belonged to Dr. J. D. Greenwood, who attended Captain Cook's widow when she was in her 90's, her husband having predeceased her by some 50 years.

Fickle Fashion

So far has the pendulum of fashion swung backward that the rich puce wedding dress of shot silk worn in the year 1848 possesses all the important style points presented by today's "new look," and the accompanying wool shawl of so fine a texture as to resemble cashmere was woven by the bride, Miss Mary Ann Caradus, on her pre-nuptial voyage aboard the Philip Laing. Two picturesque Paisley shawls and an elaborate pair of pure-silk stockings are equally old, and the map of England worked as a sampler by Amelia Perkiss is dated 1832.

Nelson has a splendid collection of sea shells and the New Zealand *Paryphanta,* a land snail almost wholly peculiar to the Dominion (e.g., 13 varieties are found in Nelson Province westward of Tasman Bay and 6 in or near the sounds area of Marlborough), though 2 or 3 kinds have been discovered in Australia. This snail, which measures up to 3in. across, feeds on vegetable matter and its habitat ranges from sea level to mountain summits. No less than 27 varieties of *Paryphanta* are displayed in the showcase, together with a map showing the locality where they were found. The museum is also the repository of the Hochstetter collection of minerals, which is rather appropriate in view of the fact that Nelson's mineral belt, covering an area of 29 square miles, is one of the world's "great geological mysteries," and the celebrated Austrian scientist Ferdinand von Hochstetter, when visiting New Zealand in 1859, first applied the name dunite to the pure olivine rock found in this zone. The Dun Mountain, behind Nelson, is largely composed of this rock, which weighs 1¼ times as much as the ordinary surface rock of the earth.



[A. R. Kingsford photo.

The folding bed used by Bishop Selwyn when travelling through New Zealand.

KNITTING BY THE CONTINENTAL METHOD

A KNITTER who holds the wool in the left hand instead of the right usually draws gazes of wonderment at her flying needles and the rate at which the garment grows. The onlookers may recognise what is called the Continental method of knitting, but most of them think it looks very complicated and difficult. They return to their right-handed knitting feeling assured that it is simpler and probably better because so many people use it. Eirene E. Unwin, Rural Sociologist, Department of Agriculture, Dunedin, asserts that this attitude is quite wrong and most unfortunate, and in this article she explains the Continental method and details its virtues and what can be accomplished with it.

MOVEMENTS for each stitch are at least one fewer when the wool is held on the left hand rather than on the right; for purl they are considerably fewer still, and for ribbing or moss stitch there is no comparison between the simplicity of the two methods. Because there are fewer movements, Continental knitting must be quicker.

This article not only describes how it is done, but explains how it simplifies Fair Isle knitting and how holding one wool on each hand enables the knitter to "weave in" easily on both the plain and the purl rows. It also gives details of a new set of patterns in two-colour knitting which are almost impossible except by holding the coloured wools one on each hand.

It is presumed that readers can already knit, though with the aid of the illustrations a beginner probably could learn how to do the Continental knitting by herself.

Holding the Wool and Needles

The wool is held in the left hand, but exactly how it is held each knitter may decide for herself. In the illustrations it has been twisted once round the little finger, then brought across the tops of the other fingers to be held loosely between thumb and first finger until the knitting is begun. The middle finger has been raised to adjust the tension on the wool. Many people hold the thread like this for crochet work.

The knitter illustrated is holding her hands under the needles. That is not essential, and some may prefer to hold their hands over the needles or one under and one over. Probably doing purl is a little easier if at least the right hand is held under the needle, but it is not really important. The only essentials are to hold the wool across the top of at least the forefinger of the left hand and to have some easy way of adjusting the tension on it.

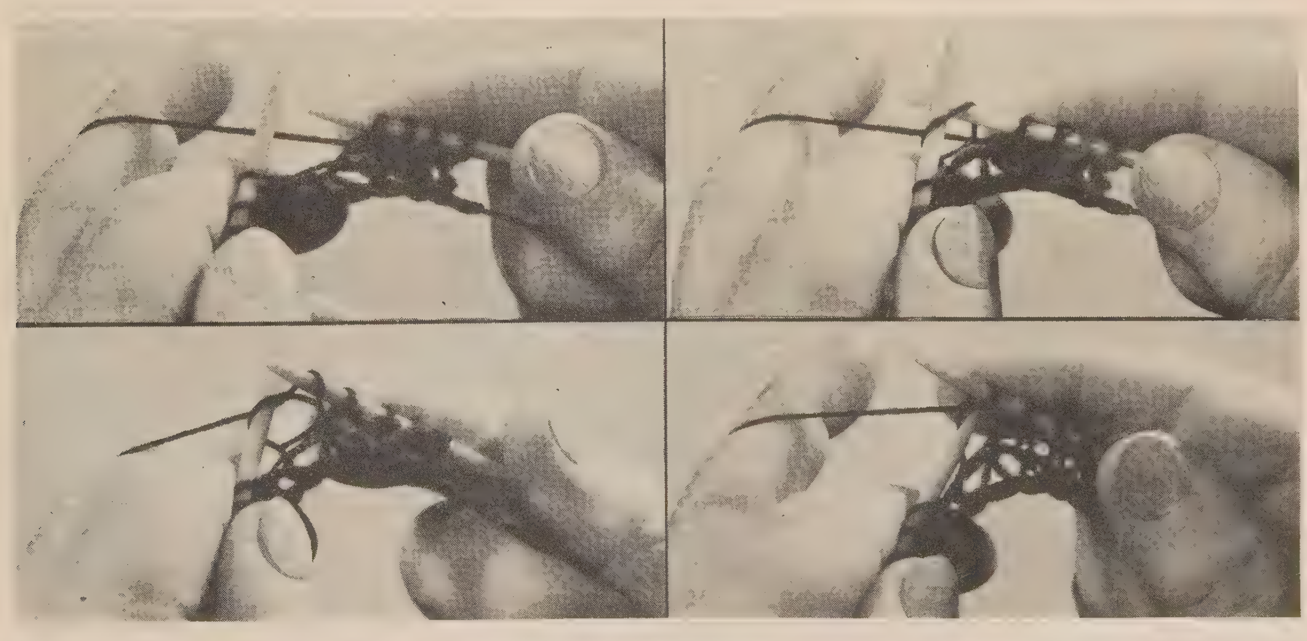
Throughout this article the needle held in the left hand is called needle i and that in the right hand needle ii. Casting on may be done by any method at all; it makes no difference to the rest of the work.

[Stewart Studios photo.

Plain Knitting

With the stitches on needle i held in the left hand and the wool held back from the work across the tops of the fingers, continue as follows:—

1. Needle ii into stitch knitways.
2. Needle ii under wool from right to left.
3. Pull wool through stitch in usual way.
4. Slide stitch off needle i. If necessary, use the tip of the right forefinger to push the needle back.



[Campbell Photography photos.

Plain knitting by the Continental method. Upper left—The wool held ready on the left hand. Upper right—Needle ii into the stitch knitways. Lower left—Needle ii hooked over the wool and the new stitch pulled through. Lower right—The stitch pulled off needle i, the right forefinger having pushed the needle back. It is then easy to bring the wool back over needle i ready for purling

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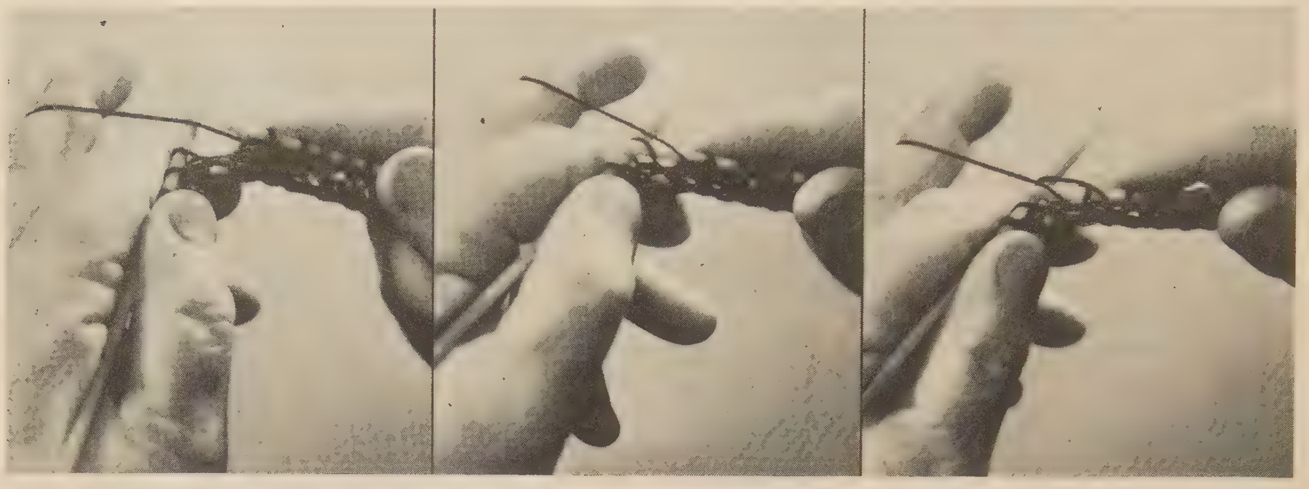


[*Campbell Photography photos.*

Purling by the Continental method. Left—The wool on the left hand over needle i ready for purling. Middle—Needle ii under the wool and into the stitch purlwise. Right—Needle ii hooked over and under the wool, making a new stitch on the needle ready to be pulled down, through, and off purlwise.

Purl Knitting

1. In bringing needle ii into position for putting it through the stitch on needle i, carry the wool over needle i instead of under it. (For the first stitch of a row the wool has to be hooked over the point of needle i with needle ii before beginning to purl.) This is equivalent to bringing the wool forward, which is necessary when purling with the wool on the right hand.

2. Needle ii under wool and into stitch purlwise.

3. Needle ii over wool from left to right, then under wool from right to left.

4. Hook wool through stitch from left to right.

5. Slide stitch off needle i. Again use the right forefinger to push the needle back if necessary.

Ribbing or Moss Stitch

Plain Stitch

1. Needle ii into position with wool under needle i.
2. Knit stitch and slide it off.

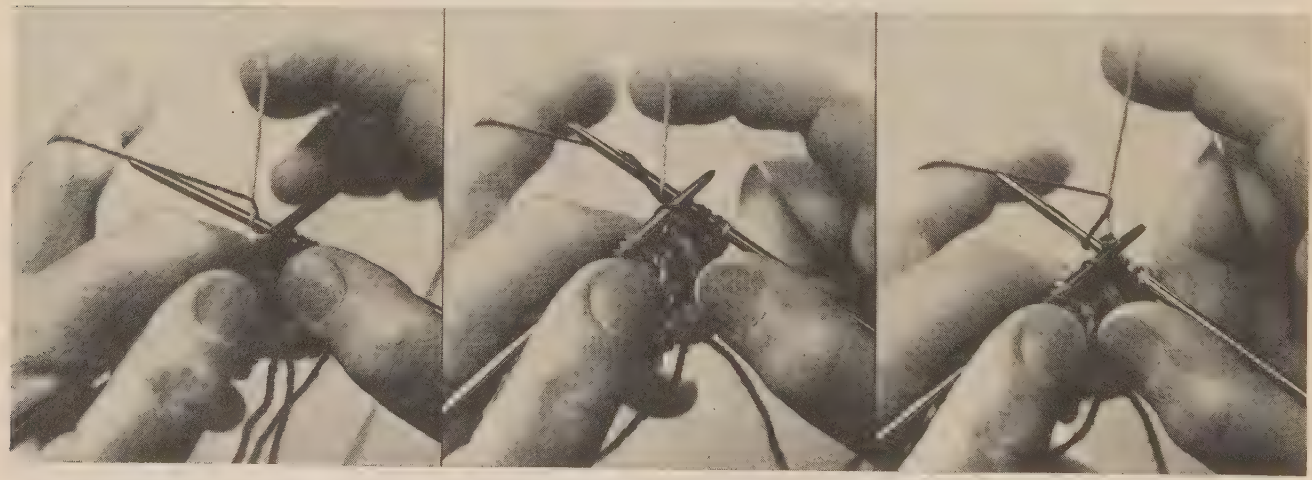
Purl Stitch

1. Needle ii into position carrying wool over needle i.
2. Purl stitch and slide it off.

After either stitch it is equally easy to make the next stitch purl or plain, thus avoiding all the bother of "wool forward" and "wool back" which is necessary when changing from one to the other in right-handed knitting. This is the great saving of time brought about by holding the wool in the left hand.

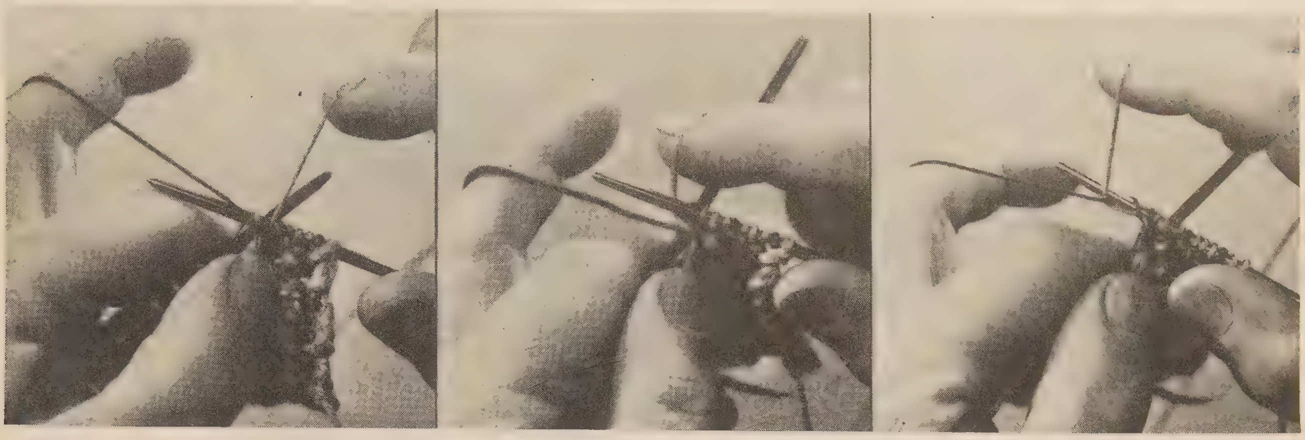
Two-colour Knitting

The ability to hold one wool on each hand when using two colours at once saves a great deal of time and muddle and also makes comparatively easy weaving in the spare thread on the purl as well as on the plain rows, which makes a much-improved fabric. The object of weaving in is to work the thread being knitted first under and then over the spare thread, so weaving in is done only with alternate stitches. If the thread were woven in on every stitch, it would come too much to the front of the work and would show; if it were not woven in at all, it would lie across the back of the work as a long loop.



[*Campbell Photography photos.*

Weaving in on a plain row. Left—Knitting with the right-hand wool and weaving in the left. Needle ii was put through the stitch knitways under the left wool, and the right wool was put over. Needle ii is shown being brought back from under the left wool to pull the new stitch through and off. Middle—Knitting with the left-hand wool and weaving in the right. Needle ii is put through the stitch knitways, the right wool passed round it, and the left wool picked up. Right—The right wool brought back again and so looped behind the left wool, and the new stitch (left wool only) ready to be pulled through and off.



[*Campbell Photography photos.*

Weaving in on a purl row. Left—Purling with the right-hand wool and weaving in the left. Both wools are forward. Needle ii is put into the stitch purlwise and under the left wool. The right wool is ready to be put round the needle over the left wool to make the new purl stitch. Middle—Purling with the left-hand wool and weaving in the right. Both wools are forward. Needle ii is put into the stitch purlwise, the right wool is back (under the needle from left to right), and needle ii is being hooked over and under the left wool to make the new stitch. Right—The new stitch made and the right wool passed forward again under needle ii from right to left. The new (left-wool) stitch is now pulled down, through, and off as usual for ordinary left-hand purling.

Weaving in on Plain Row

Knitting with the right-hand wool and weaving in the left-hand wool:

1. Needle ii into stitch under left-hand wool.
2. Right-hand wool over needle ii.
3. Needle ii from under left-hand wool back through stitch and finish as usual.

Next stitch: Knit with right-hand wool without weaving in—that is, knit over, not under, the left-hand wool.

Knitting with the left-hand wool and weaving in the right-hand wool:

1. Needle ii into stitch.
2. Right wool round needle ii.
3. Pick up left-hand wool with needle ii as for left-hand knit.
4. Right wool back.
5. Pull left-hand wool through stitch and finish as usual.

Next stitch: Knit with left-hand wool without weaving in.

The principle behind the weaving in is first to put the spare thread round or across the needle, next to pick up the thread to be knitted, and then to put the spare thread back again, before pulling the knitting thread through. This loops the spare thread round the knitting thread, but it remains at the back of the work and is not pulled through the stitch to appear on the right side. Weaving in on the purl row involves the same principle, but the threads are all on the front or purl side of the work and the spare thread must be kept on this side, toward the knitter, and looped round the knitting thread from in front.

Weaving in on Purl Row

Purling with the right-hand thread and weaving in the left-hand thread; both wools are forward or in front:—

1. Needle ii through stitch purlwise under left-hand wool.
2. Right wool over left wool and round needle ii.
3. Finish stitch; left-hand wool slips back of itself.

Purl the next stitch with the right-hand wool, keeping the left-hand wool to the left of the stitch out of the way so that it is not woven in.

Purling with left-hand thread and weaving in the right-hand thread; both wools are forward:—

1. Needle ii into stitch purlwise.
2. Right-hand wool back—that is, under needle ii from left to right.
3. Needle ii over and under wool as usual to pick it up for left-hand purl.
4. Right-hand wool forward—that is, under needle from right to left.
5. Finish stitch by drawing left-hand thread through stitch as usual and slipping it off needle i.

Purl the next stitch with the left-hand wool without weaving in.

Honeycomb Patterns

The patterns which follow are a new development of two-colour knitting, virtually impossible to anyone holding both wools on one hand. Holding one colour on each hand and always working the colours alternately across each row allows of a whole new series of patterns, quite different from Fair Isle or any other type of knitting.

The new stitches have been called honeycomb patterns, which is a good name for them, as the colours seem to interlace like the cells of a honeycomb and the fabric is full of extra pockets or cells of imprisoned air, which make it unusually warm. The second yarn makes the fabric thicker rather than wider than similar knitting with only one yarn, and this extra thickness gives the extra air pockets and extra warmth. The second yarn also makes the fabric nearly double the weight of one of the same size knitted with a single yarn. This means that the honeycomb patterns are very suitable for garments in which extra warmth is wanted, such as some baby clothes, for cot blankets and shawls, and for extra-warm woollies that are required to look dainty so that extra-thick wool is not suitable. However, the new stitches are not suitable for yarns other than wool, such as cottons and "silks," which do not knit up into warm fabrics in any case and in which the extra weight would be a distinct disadvantage

In all these patterns the two colours, one held on each hand, are worked alternately along every row; that means that the stitches are worked throughout first one with the wool in one hand and then one with the wool in the other hand. In consequence, no weaving in is necessary—in fact, so closely are the colours intertwined that generally a stitch appearing on one side as one colour is backed by one of the other colour on the other side. There are no long "floating" threads anywhere.

Altering the relative ways in which the two colours and the two hands are used with plain and purl stitches gives an infinite variety of patterns, but they can be divided into two main types—the true honeycombs, in which the colours are inextricably intertwined, and the double fabrics, in which each colour appears alone on one side throughout each row and, in fact, two separate layers of ordinary knitted fabric are made. How the variations are carried out and how to tell which type of fabric to expect from a combination of stitches and colours is explained in the directions for the patterns which follow.

For the four honeycomb patterns given it is necessary to cast on an odd number of stitches, and these may be done all in one colour. The first row may be knitted in the same colour as the casting on and is not part of the

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pattern; it is done because it is simpler to work the pattern into a plain row than into the casting on. Directions are given for only the pattern rows after the casting on and the first plain row have been done.

For simplicity the two colours are called black and white; these are abbreviated to b and w, knit to K, and purl to P.

For the four honeycomb patterns black is always held on the right hand and white on the left for the first row.

Honeycomb 1

1st row: *P1b (right hand); keep b wool in front. K1w (left hand); keep w wool behind*. Repeat this, right hand P, left hand K, to end of row. Finish with a right hand P.

2nd row: Keep colours on the same hands and repeat 1st row. This will mean working b into b and w into w, but purling into plain and plaining into purl.

Continue like this for the whole of the pattern.

Honeycomb 2

1st row: *K1b (right hand), keeping b wool close behind right-hand needle. P1w (left hand), dropping w wool behind left-hand needle*. Repeat this, right hand K, left hand P, to the end of the row. End with a right hand K.

2nd row: Keeping the colours on the same hands, repeat row 1. This also means working b into b and w into w and purling into plain and plaining into purl, but the plain and purl stitches are worked with the opposite hands to those used for honeycomb 1, which produces a different pattern.

Continue like this for the whole of the pattern.

Honeycomb 3

1st row: *K1b (right hand), keeping wool close behind right-hand needle. P1w (left hand), dropping wool behind left needle*. Repeat to end of row, right hand K, left hand P, finishing with a right hand K.

2nd row: Change wools to opposite hands (that is w on right hand, b on left). *K1w (right hand), keeping wool back. P1b (left hand), wool behind*. Repeat, right hand K, left hand P, to end of row. End with a right hand K.

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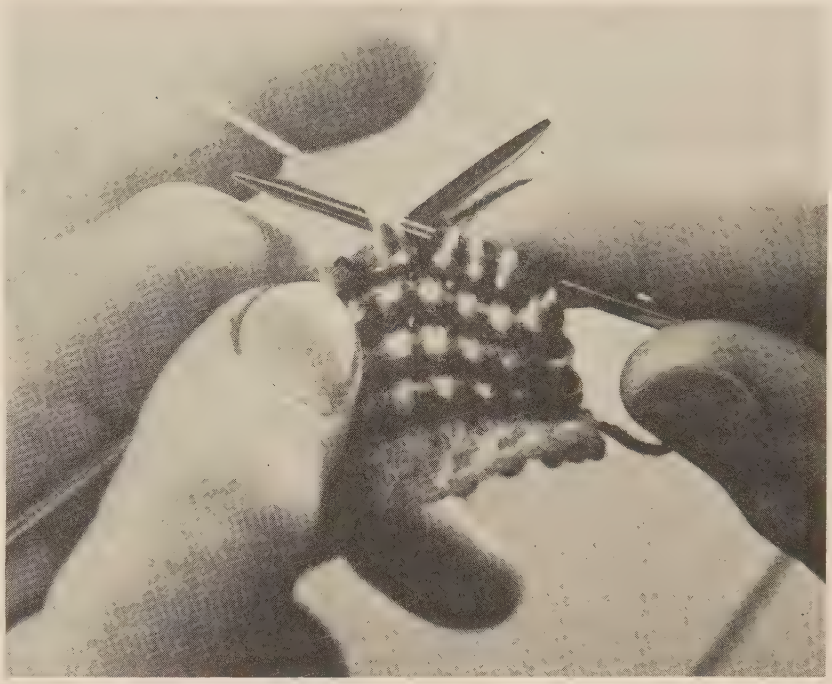


[*Campbell Photography photo.*

Working honeycomb 2, purling with the left wool white into white. The next stitch will be knitted with the right wool black into black. The black wool is kept close behind the right-hand needle. When the white stitch is finished the white wool must be dropped behind the left-hand needle before the black stitch is knitted.

Change wools again and repeat these two rows throughout. This means not only plaining into purl and purling into plain, but working b into w and w into b.

Honeycomb 4

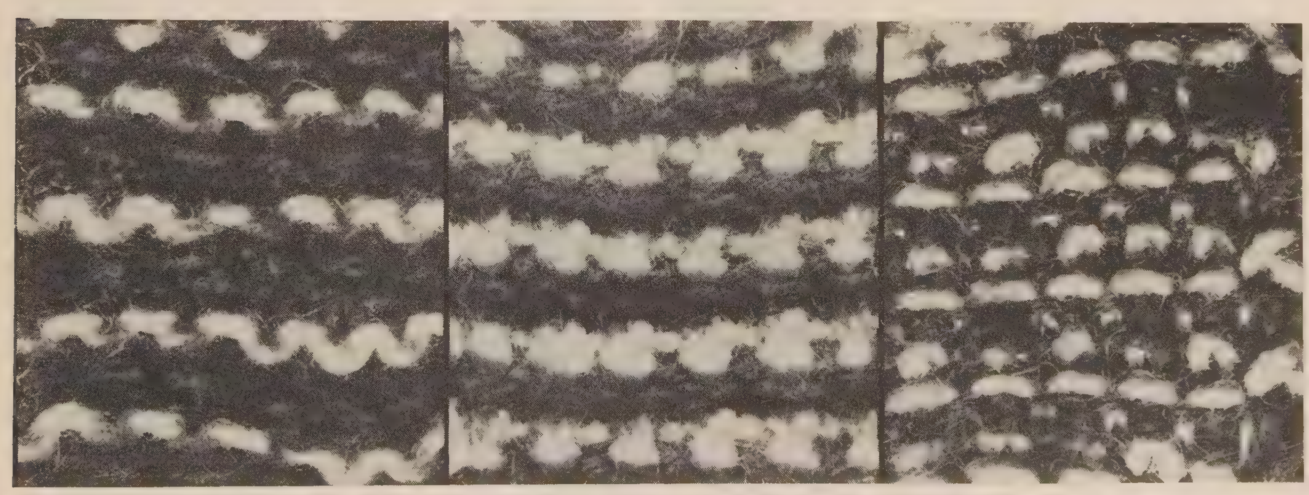
This is a variation of honeycomb 1. The first row is the same, then the wools are changed to the opposite hands and the row repeated, but with the colours reversed. This pattern is not as pretty as the other three and is not illustrated.

Double Fabrics

All the double fabrics are excellent for cot blankets, and each set of directions describes how to make a rectangular piece of double fabric with a border fastening the two layers together.

Double Plain

Cast on any number of stitches and knit a few rows in any one of the honeycomb patterns for a border. Continue the honeycomb for a few stitches



From left—Honeycombs 1, 2, and 3.

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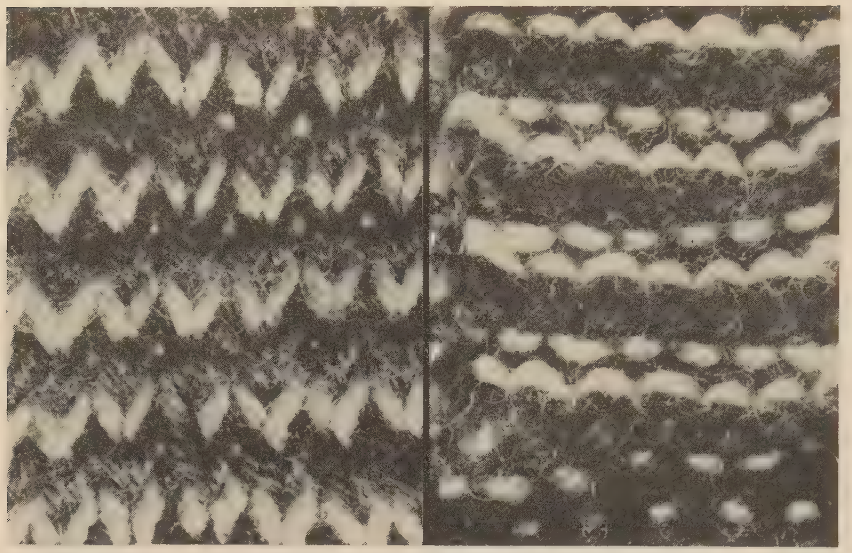

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Double plain stripe (left) and double purl stripe.

at the beginning and end of each row to make side borders while knitting the double fabric in the middle as follows:—

All rows are alike and there are four things to remember throughout—work b into b and w into w; work plain into plain and purl into purl; knit with the right-hand wool and purl with the left; and keep the right-hand wool forward between stitches and the left-hand wool back. To do all these the colours must be worked alternately across each row as before and the colours changed into the opposite hands between rows. Therefore it is best to choose for a border one of the honeycombs in which the wools are also changed to the opposite hands between rows. Finish off with a border of the honeycomb right across as at the beginning.

Double Purl

As for double plain, work a honeycomb border (again preferably one in which the wools are changed every row) across bottom and top and up either side. Purl with the right-hand wool and knit with the left, but otherwise work as for double plain—work b into b, and w into w, K into K and P into P, and keep the right-hand wool forward between stitches and the left-hand wool back. Again work alternate colours across each row and change wools between rows.

Because this pattern means less putting of wools backward and forward between stitches, it is quicker than the double plain fabric, but it is not as pretty. No doubt the knitter could also work out how to make a double fabric that appeared plain on one side and purl on the other, which would come between the other two for speed, as the wool would have to be put backward and forward only on alternate rows.

Double Plain Stripe

This is worked as for double plain, but the colours are not changed between rows, and b is worked into w and w into b. Therefore a different honeycomb is best for the border—one in which the wools are not changed either.

Double Purl Stripe

The pattern can be worked out quite simply from double purl with alterations similar to those for double plain stripe.

The double striped fabrics need not be one-one stripes only. Any variety of stripe widths can be worked out. Changing the wools after rows 1 and 2 but not after row 3 produces a three-three stripe; changing them only after every third row produces a two-one stripe on both sides, but with one colour predominant on one side and the other on the opposite side.

[*Campbell Photography photo.*

A sample of double plain fabric with the two sides of different colours quite separate but held together at the edges.

Other Variations Possible

Numerous other varieties of honeycomb patterns or double fabrics may be worked out. There are two different stitches, purl and plain, either of which may be worked with either hand and either of which may be knitted into the same or the other kind of stitch in the previous row. The two colours are always alternated across the row, but either may be worked into a stitch of the same or the other colour in the previous row. Each thread may be kept forward or back while the next stitch is being worked with the other wool. All these changes make slight differences in the pattern. The variety of possible combinations must number several hundreds, possibly several thousands.

However, it is easy to determine whether any combination will make a double fabric or a honeycomb. To make double fabric the stitches of the front layer must always be worked with the right hand and the right-hand wool must be kept forward between stitches, while the stitches of the back layer must always be worked with the left hand and the left-hand wool kept at the back between stitches. If the front stitches are worked with the left hand and the back stitches with the right hand, or if the right-hand wool is dropped behind the right needle or the left-hand wool kept in front of the left-hand needle between stitches, the fabric will not be double but one of the honeycombs. Knitting honeycomb borders round the double fabrics is not always essential, though very pretty cot blankets can be made in this way. If a plain double fabric (that is, not a stripe) without a border is desired, the wools must be twisted round each other at the end of every row or the sides would be completely separate.

Knitting Two Parts at Once

The two sleeves or the two fronts of a cardigan may be knitted at once on the same needles by this double-fabric method if care is taken not to twist the wools round each other at the ends of each row. To begin with, the two pieces should be cast on separately, and it is easiest to do any ribbing or patterned edge first before combining them. Then hold them together, right sides inward, with the wools held on the left hand. With a third needle pick the stitches off the two needles alternately until all are on the new needle, and then work as for the double purl fabric according to the pattern being used. To decrease purl two stitches from the front piece together, slip the stitch in between back on to the needle, and knit it and the next stitch together. The two pieces must be cast off separately.

However, as this method would be necessary only to a knitter who has difficulty in knitting two sleeves or two fronts to match, probably it would not be required by one who has mastered not only left-hand and right-hand knitting, but also the art of combining them to produce the double fabric and honeycomb patterns. It can be used to advantage by the most accomplished knitter for making pockets in knitted garments.

Soups of Many Nations

As the weather becomes colder soups make an interesting and appetising addition to the menu. Though many interesting, attractive, and economical recipes are already in use in New Zealand, it is still possible to introduce some of the lesser-known soups of other countries which are just as economical and generally more highly flavoured than the common soups. They are the subject of this article by Nell Macpherson, Rural Sociologist, Department of Agriculture, Auckland.

NEARLY every country has a soup which is regarded as so common there as to be called a national soup. Because these soups are made in the homes of the people as a whole, they are usually fairly cheap. Most New Zealanders know the names of the national soups of England, Scotland, Ireland, Wales, and Australia, but not the names of the less common ones of other countries.

Many of these soups are a meal in themselves and are treated as such in their own countries. In New Zealand, therefore, they are more suitable as lunch or tea dishes than as a part of a dinner menu. Many of the recipes given are similar, though they appear under different names in different countries. Soups are more common in the colder countries.

In many of these soups the maker varies the ingredients slightly, particularly the herbs and other seasonings, according to the season of the year and also according to the health of the people who are going to eat the soup. Thus the soup performs a double function as a food and as a medicine. This is particularly so in China. Most of the European soups are made from traditional recipes handed down through the generations in a family. They all have certain basic ingredients and the other ingredients are added if the family circumstances will allow. These ingredients therefore are given as possible additions to the soups. In some recipes the ingredients are not available in New Zealand and substitutes are given. It is important that the cook use her judgment about the amount of herbs and seasonings to add, and the recipes are intended as a guide in that respect and not as an absolute standard.

The recipes are given in the order of Great Britain, the Commonwealth, and the others in probable order of familiarity to the New Zealand public.

White Sauce and Stock

Apart from the soups made with white sauce, meat or bones with vegetables form the basis of recipes given. The stock and sauce are prepared as follows:—

Meat stock: A less tender cut of meat such as shin or shank, containing bone and fat as well as muscle meat, is suitable for meat stock. Wipe it thoroughly, cut the meat off the bone, and saw or chop the bone to expose the marrow. Allow 1 pint of water to each 1lb. of meat and bone, soak them for 1 hour, and then heat them slowly to simmering point. Cook the stock for 4 to 6 hours and add vegetables and seasoning toward the end of the cooking period. Strain it. If the stock is to be kept, do not skim off the fat until just before preparing soup, as it helps to keep the stock longer. Store the stock in a cool place; a refrigerator is best.

Chicken stock is made in the same way as meat stock, but chicken or fowl bones are used instead of shin or shank. A boiling fowl may also be used.

Thin white sauce: Melt 2 tablespoons of fat and add 2 tablespoons of flour, stirring over heat until the mixture is smooth but not brown. Add ½ cup of cold milk gradually and stir until the mixture is smooth. Add 1½ cups of heated milk and cook the sauce for 5 minutes, stirring all the time.

Heading photograph by Sparrow Industrial Pictures Ltd.

SOUPS OF MANY NATIONS . . .

Hare Soup (England)

1 hare
3 onions
1 sliced carrot
2 sticks of celery cut into short lengths
3 quarts of stock
1 teaspoon of mixed herbs
½ cup of breadcrumbs
1 slice of bacon
Salt
Cayenne pepper

Boil all the ingredients except the breadcrumbs, salt, and cayenne pepper for 2 hours and strain them. Cut up the hare and brown the pieces in a little fat in a frying pan. Cut the meat from the bones and chop it finely or mince it. Return the meat to the liquid and reheat it. Add the breadcrumbs and salt and cayenne pepper to taste. Simmer the soup for ½ hour.

Scotch Broth (Scotland)

1lb. of neck of mutton
1 turnip
1 leek or onion
1 tablespoon of barley
1 large potato
1 grated carrot
1 tablespoon of dried peas
½ teaspoon of chopped parsley

Wipe the meat, cut it into neat joints, put it in a pan with 1 quart of water, and season it to taste. Bring the water slowly to the boil and skim it. Wash the barley and peas, cut the other vegetables into small pieces, and add them to the meat. Simmer the mixture for 2 hours. Remove the meat, shred it, and return it to the liquid. Bring the soup back to simmering point and add the parsley before serving it.

Mulligatawny (Ireland)

1 rabbit
Gravy bones
1 carrot
1 turnip
Salt
6 onions
6 tablespoons of flour
1 tablespoon of curry powder

Boil the rabbit in 2 quarts of water until it is quite tender, then take it out and remove the meat from the bones. Put the gravy bones in the water in which the rabbit was boiled, add the chopped vegetables, simmer the stock for two hours, then strain it. Mix the flour and curry powder to a smooth paste with ½ pint of water and add it to the stock. Boil the stock for 15 minutes. Add the chopped rabbit meat and bring the soup back to boiling point before serving it.

Cock-a-Leekie (Wales)

1 old hen
1 tablespoon of vinegar
4 large leeks
¼lb. of prunes
1 tablespoon of chopped parsley
½ cup of rice or barley

Soak the hen overnight in water to which the vinegar has been added. Wash it well, cover it with water, bring it to the boil, and simmer it for 2 to 3 hours. Add the rice and leeks and cook them until they are tender. Add the prunes, stewed and stoned. Take out the hen and cut some slices from the breast. Skim the fat off the soup. Return the slices of breast to it, and add the parsley before serving it.

The remainder of the meat on the hen should be removed from the bones and either used with a white sauce as a lunch dish or minced for sandwiches.

Kangaroo Tail (Australia)

1 kangaroo tail
2lb. of gravy beef
4oz. of butter
1½oz. of flour
1 carrot
1 onion
2 or 3 sprigs of parsley
1 bay leaf
Salt and pepper

Prepare and slice the vegetables. Wash the tail and divide it at the joints. Heat the butter in a stew pan, fry the tail in it until it is well browned, then remove it and fry the beef cut into thin slices. Strain off the butter and put it aside. Replace the tail in the pan, add 3 quarts of water and ½ teaspoon of salt, and bring it to the boil. Skim the liquid well and put in the prepared vegetables, parsley, bay leaf, and a good seasoning of pepper. Cover the pan closely and simmer the contents for 4 hours. Strain the liquid and remove every particle of fat from the surface. Reheat the butter used for frying, adding more if necessary, stir in the flour, and cook it for 3 or 4 minutes. Add the stock, bring it to the boil, put in a few pieces of the tail, season it to taste, and bring the soup back to the boil before serving it.

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Toheroa Soup (New Zealand)

12 toheroas
2 onions
3 quarts of milk
Cornflour

Remove the toheroas from the shells and wash them well. Mince the toheroas and the onions and mix them lightly together. Bring the milk to the boil, add the toheroa and onion mixture, and let it simmer for 2 hours. Thicken the soup with cornflour—2 tablespoons is enough. Two or 3 tablespoons of cooked green peas may be added just before the soup is served.

Gumbo (Southern U.S.A.)

1 onion, finely chopped
4 tablespoons of fat
1 quart of chicken stock
1 cup of cooked okra
2 teaspoons of salt
½ green pepper, finely chopped
Pepper

Cook the onion with the fat for 5 minutes, stirring constantly. Add the other ingredients, bring the soup slowly to boiling point, and simmer it for 40 minutes. Add water if necessary to maintain the volume.

Okra looks like a bean but has a rather savoury flavour. It is not usually available commercially in New Zealand, but it can be grown fairly easily in the warmer areas.

Cream of Corn (Middle-western U.S.A.)

2 cups of thin white sauce
1 cup of cooked or canned corn
2 tablespoons of chopped onion

Cook the onion in a little fat until it is tender. Add it and the corn to the white sauce. Reheat the soup almost to boiling point and serve it with toast fingers.

Cream of Tomato (Middle-western U.S.A.)

2 cups of thin white sauce
3 tomatoes
1 teaspoon of sugar
1 onion
Parsley
½ teaspoon of salt
2 cloves

Chop the onion, slice the tomatoes, place them together in a saucepan, and simmer them until they are tender. Add the cloves, sugar, and salt, and cook the mixture for 5 minutes. Sieve it and add the chopped parsley. Pour the sieved tomato mixture slowly into the white sauce, stirring vigorously, and reheat it.

Clam Chowder (Eastern seaboard of U.S.A.)

1 to 2 cups of clams
1 small onion, sliced
1 tablespoon of chopped celery
½ tablespoon of salt
Pepper to taste
1 slice of bacon or pickled pork
4 crackers
½ tablespoon of chopped green pepper
2 cups of diced potatoes
2 cups of milk
½ tablespoon of flour

Wash the shellfish, heat them in their own liquor to boiling point, and chop them. Place the bacon or pork in a hot pan and cook it lightly. Add the onion, celery, and green pepper and cook them until they are light brown. Stir in the flour, cook it until it is bubbly, and add 1 cup of boiling water and the salt, pepper, and potatoes. When the potatoes are nearly cooked add the shellfish and liquor.

Simmer the mixture until the potatoes are tender. Add the milk and crackers. Reheat the chowder and serve it very hot.

In New Zealand oysters or mussels may be used instead of the clams.

Pot-au-Feu (Northern France)

3 pints of good beef stock
¼ turnip
½ teaspoon of chopped parsley
Salt
Nutmeg
½ carrot
¼ cabbage
1oz. of fat
½ bread roll
Pepper

Partly cook the cabbage, carrot, and turnip and drain them. Shred the cabbage and dice the carrot and turnip. Melt the fat in a saucepan and add the vegetables, salt, pepper, and nutmeg to taste. Cover the mixture and cook it for 10 minutes. Add the stock and simmer the soup for ½ hour. Slice the bread roll thinly and brown it in the oven. Add the parsley and bread to the soup and serve it very hot.

Bouillabaisse (Southern France)

1 small lobster
Cod
Crab
2 large onions
3 clovers of garlic
2 tomatoes
Pinch of saffron
Salt
Gurnet
Eel
Thyme
Parsley
Strip of orange peel
½ breakfast cup of olive oil
Pepper

There should be 2lb. of fish flesh altogether. Keep the coarse fish separate from the fine fish. Any fish may be used in bouillabaisse, and the practice in France is to include any fish caught in the nets which is too small for sale. Put the chopped onions, chopped parsley, sliced tomatoes, garlic, thyme, saffron, orange peel, and olive oil into a saucepan. Add the coarse fish, cover them all with boiling water, and boil the mixture hard for 5 minutes. Add the finer fish and boil it hard for another 5 minutes. Put slices of bread into soup plates and pour on the strained liquor. Place the fish mixture on the bread.

Mushroom Soup (Poland)

2 quarts of stock
2oz. of flour
2oz. of butter or fat
6 tablespoons of sour cream
Salt
1 to 2lb. of fresh mushrooms or 1 tin of mushrooms
Pepper

Add the stock to the peeled mushrooms and boil them until they are tender. Remove the mushrooms, chop them into pieces, and return them to the stock. Melt the fat, stir in the flour, mix it to a paste with a little hot stock, and add it to the soup. Add salt and pepper to taste. Just before serving the soup add the sour cream, which gives this soup its characteristic flavour.

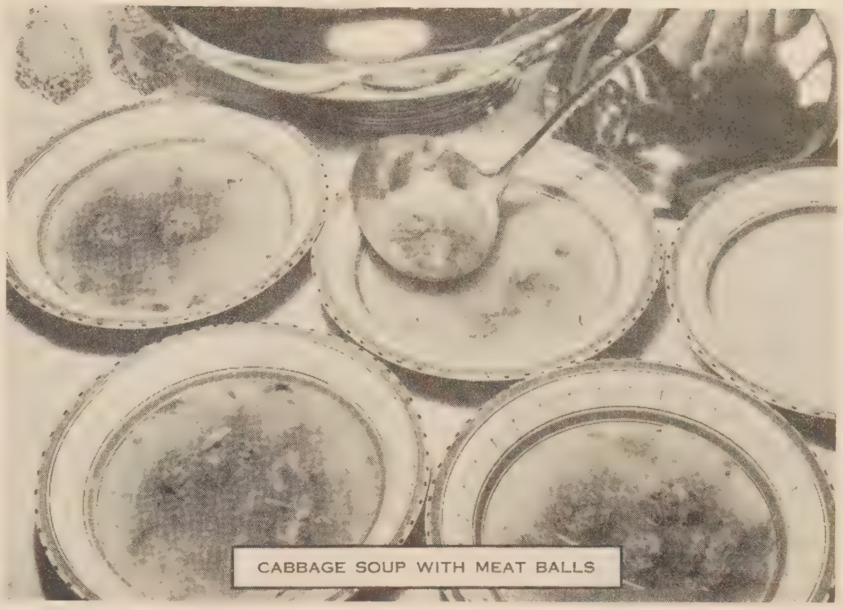
In Poland dried mushrooms are used; ¼lb. is sufficient for the quantities given. They should be soaked before use for ½ hour in boiling water.

Bortch (Russia)

2 medium-sized beetroot
1 quart of meat stock
1 tablespoon of fat
½ pint of milk
3 celery stalks
2 onions or leeks
1 dessertspoon of flour

Peel and slice the beetroot, shred the celery stalks, slice the leeks, and cook the vegetables for a few minutes in the fat without browning them. Add the stock and simmer the vegetables until they are tender (¾ to 1 hour). Sieve the mixture and return it to the saucepan. Add the flour mixed with the milk, bring the soup back to boiling point, and season it to taste.

A lightly beaten egg may be folded into the bortch just before serving it, and the addition of a tablespoon of sour cream at the same time improves the flavour.



CABBAGE SOUP WITH MEAT BALLS

[*Sparrow Industrial Pictures Ltd. photo.*

Artichoke Soup (Palestine)

2lb. of Jerusalem artichokes
1 onion
2 sticks of celery
1 quart of stock
½ pint of milk

Peel and slice the artichokes, onion, and celery and cook them in a little fat for a few minutes; do not brown them. Pour on the stock and simmer the vegetables until they are tender (about 1 hour). Sieve the mixture and return it to the saucepan. Add the milk, season the soup to taste, stir it until it is boiling, and serve it with fingers of toast.

Green Cod Soup (Norway)

5lb. of green cod or smoked fish
1 wine glass of marsala or sherry
5 teaspoons of salt
1 tablespoon of flour
1 tablespoon of butter

Simmer the fish in 5 pints of water for 3 hours. Melt the butter, mix in the flour, cook them to a light golden yellow, and add this to the fish soup. Just before serving the soup add the wine.

Giblet Soup (Denmark)

2 sets of poultry giblets
½ carrot
1 stick of celery
1oz. of fat
½ tablespoon of flour
Salt
Pepper
2 quarts of stock
1 onion
Parsley as desired
Thyme as desired
1 tablespoon of cooked macaroni
½ sherry glass of sherry

Skin the gizzards, scald and skin the feet, wash the neck and liver, dry them, and cut them into small pieces. Melt the fat and fry the giblets and sliced vegetables until they are brown. Add the herbs, stock, and salt and pepper to taste. Cook the mixture gently for 2 hours, strain it, and return the liquid to the saucepan. When it is boiling add the flour, mixed with the sherry, and cut-up macaroni. Return the gizzard, liver, and heart to the soup. Serve it with croutons.

Cabbage Soup with Meat Balls (Sweden)

1 cabbage
1 tablespoon of golden syrup
3 tablespoons of butter
3 quarts of stock

Chop the cabbage and brown it in the butter. Add the syrup and cook the mixture until the syrup turns brown. Add the stock and simmer the soup for 3 hours.

Meat Balls:

¼lb. of mince
1 teaspoon of flour
½ teaspoon of pepper
2 tablespoons of butter or fat
½ cup of milk
1 tablespoon of breadcrumbs
2 teaspoons of salt

Mix all the ingredients smoothly together and shape the mixture into small balls. Boil them in salted water for 10 minutes and add them to the soup just before serving it.

Kidney Soup (Germany)

2 quarts of stock
2 tablespoons of milk
2 tablespoons of flour
Mixed herbs
2 shallots
1 to 2 calf kidneys
2 egg yolks
Salt
Pepper

Slice the kidneys and cook them in a little fat with the chopped shallots and herbs until they are light brown. Sprinkle on the flour and cook it until it is brown. Add these ingredients to the hot stock and simmer them for ½ hour. Add salt and pepper to taste. Mix the egg yolks with the warm milk and stir the mixture into the soup 5 minutes before serving it.

Tomato and Egg Soup (Portugal)

3lb. of tomatoes
2 tablespoons of butter
3 or 4 hard-boiled eggs
2 onions
1 tablespoon of parsley
2 quarts of stock
Salt
Pepper

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Quarter the tomatoes, slice the onions, and cook them in a lightly greased saucepan for 15 minutes. Add the boiling stock and parsley and simmer the mixture for 1½ hours. Sieve it, rubbing the tomatoes and onions through. Return the soup to the saucepan, season it to taste, and add the butter just before serving it. Peel and slice the eggs, place them in a tureen, and pour the soup over them.

Potato Soup (Hungary)

3 large potatoes
1 tablespoon of parsley
1 green pepper or 1 tablespoon of paprika
1 medium-sized onion
3 tablespoons of sour cream
1 quart of stock
1 tablespoon of lard

Melt the lard and add the chopped onion, pepper, and potatoes diced fairly small. Cook the mixture until the onions are light golden, then sprinkle on the parsley. Add the stock and seasoning. Simmer the soup for ½ hour or until the potatoes are cooked and stir in the sour cream just before serving it.

Cabbage Soup (Austria)

1 cabbage
2 fried sausages
Salt
1 tablespoon of flour
Fat
3 pints of stock

Shred the cabbage and brown it in a little fat. Sprinkle it with the flour and cook it until the flour browns, stirring gently. Pour on the stock, add salt to taste, and simmer the soup for 1 hour. Five minutes before serving time slice the fried sausages into the soup.

Eel Soup (Holland)

1lb. of eels
1oz. of fat
1 tablespoon of flour
2 peppercorns
1 small onion
Pinch of mace
Pinch of salt
½ teacup of cream or milk

Wash the eels, cut them into small pieces, and put them in a saucepan with the fat. Let them simmer for a few minutes, then add 3 pints of water, the onion (sliced), mace, salt, and peppercorns. Simmer the eels until they are tender but unbroken. Dish them carefully and keep them hot. Mix the flour to a paste with a little water, stir it into the soup, and boil it. Add the cream or milk and pour the soup over the eels.

Lemon Soup (Greece)

2 quarts of stock
2 egg yolks
Grated rind of a lemon
2 tablespoons of rice
1½ tablespoons of lemon juice

Simmer the rice in the stock for 10 minutes. Add the egg yolks mixed with a little stock and the grated lemon rind. Just before serving the soup add the lemon juice. Serve it with slices of rye bread if obtainable.

Hotchpotch (Belgium)

2lb. of neck of mutton
1 carrot
½ turnip
1 small cauliflower
Salt
1 onion
1 teaspoon of chopped parsley
1 cup of shelled peas
1 lettuce
Pepper

Cut the meat into neat pieces and put them in a stewpan with 1 teaspoon of salt and 2 quarts of water. Bring the water slowly to the boil and skim it well. Shred the lettuce, cut off the stalk of the cauliflower and break the head into sprigs, and dice the turnip, carrot, and onion. Simmer the meat for 1 hour, then add the onion, carrot, and lettuce. Half an hour later add the turnip, peas, and cauliflower. Simmer the soup for 1 hour, add the parsley, and season it to taste. Serve the soup very hot.

Onion Soup (Spain)

2 spanish onions
1 tablespoon of olive or salad oil
1 tablespoon of vinegar
Slices of toast
Yolks of 2 eggs
1 quart of stock
Salt
Pepper

Shred the onions and fry them in hot oil until they are golden brown. Add them to the stock, season it, and simmer it for 10 minutes. Beat the egg yolks with a little vinegar. Place the egg mixture in a tureen and pour the stock and onion over it, mixing well. Add 1 slice of toast per person and serve the soup immediately.

Minestrone (Italy)

3 pints of stock
¼lb. of salt pork
½lb. of spinach
½lb. of tomatoes
1 stick of celery
½ cup of rice
3 tablespoons of parmesan cheese or processed or packet cheese
1 clove of garlic
½lb. of kidney beans
½lb. of peas
3 or 4 carrots
1 spanish onion
Sage
Parsley
Salt
Pepper

Boil the stock and add the pork, vegetables, and rice. Stir the mixture thoroughly, season it, and simmer it until the ingredients are tender and the soup thick. Stir in the cheese and remove the soup from the heat immediately. Serve it either hot or cold with crackers.

Bird-nest Soup (China)

¼lb. of dried bird-nest powder
1 egg white
1 young chicken
1 pork bone
1 tablespoon of powdered ham

Preparation of stock: Cut the breast off the chicken and put it aside. Place the remainder of the chicken and the pork bone in a saucepan, cover them with water, and simmer them for 2 hours. Strain the stock.

Add the bird-nest powder to 2 quarts of the stock and thicken it with the chicken breast powdered by pounding it with a blunt instrument, which may take 2 to 3 hours. Remove the soup from the heat and add the egg white, lightly beaten. Serve it in plates or bowls and add the powdered ham as a garnish.

Bird-nest powder is made from the cleaned and purified lining of the nest of a swallow found in China. This greyish-white lining is produced by glands in the mouth of the bird.

Shark-fin Soup (China)

1½lb. of shark fins (dorsal fins are best)
1 egg white
3 quarts of stock, made as for bird-nest soup

Cut the edges off the fins, add the fins to the stock, and boil them for 2 to 3 hours. Strain the soup and thicken it with powdered chicken breast and lightly beaten egg white. This soup does not have a fishy taste.

Both the shark fins and the bird-nest powder are available throughout New Zealand in Chinese stores. Both these soups are expensive.

Mehl Suppe (Switzerland)

1 cup of flour
Milk
Salt
Pepper

Roast the flour until it is fairly brown. Add the cold milk slowly and mix them to a thin cream. Heat the soup to boiling point, stirring all the time, and add salt and pepper to taste.

Bonen Suppe (Switzerland)

1 shin bone
2 carrots
½ cup of lima beans
Chives
2 onions
1 leek
2 tablespoons of barley
2 potatoes

Dice the vegetables. Put the bone, onions, carrots, leeks, beans, and barley into a saucepan, cover them with water, and boil them for 1½ hours. Add the potatoes and cook them until they are tender. Add the chives before serving the soup. Do not skim it.

Fideli Suppe (Switzerland)

2 soup bones
2 onions
Chives
Vermicelli, spaghetti, or noodles
Parsley

Boil the bones and onions in 3 quarts of water for 2 hours. Strain the liquor and add the vermicelli, chopped chives, and parsley. Boil the soup rapidly until the vermicelli is tender. The amount of vermicelli used depends on personal taste; spaghetti or noodles may also be used.

Noodles: Add ½ teaspoon of salt to 1 or 2 egg yolks and stir in enough flour to make a stiff dough. Knead it until it is smooth and roll it as thin as possible (paper thin is best). Cover it with a clean cloth and leave it for ½ hour. Roll up the dough and cut the roll into ⅛in. slices. Shake the slices into strips, cut them into the desired lengths, and cook them as for boiled macaroni.

Supa Crvenoga Graha (Yugoslavia)

1 gallon of stock
Bacon or ham bones
1 stick of celery
1lb. of pumpkin
4lb. of red beans
1lb. of carrots
Any other root vegetables available

Dice the carrots, pumpkin, celery, and root vegetables. Simmer all the ingredients together until the vegetables are tender. Strain the mixture and sieve the vegetables. Season the soup to taste. This soup is thick.

Rebarska Supa (fish soup—Yugoslavia)

2lb. of unboned fish
2lb. of a mixture of any vegetables
2 quarts of water or stock
1 carrot
2 tomatoes
1 tablespoon of rice or barley

Cook the fish and mixed vegetables in the stock until the vegetables are tender, then strain them. Add the finely grated carrot, rice, and sliced tomatoes. Serve the soup very hot.

Manestra (Yugoslavia)

1 gallon of stock
½lb. of turnips
½lb. of swede
½lb. of carrots
½lb. of potatoes
¼lb. of parsnips
2 celery sticks
½lb. of cabbage
½lb. of onion
2 tablespoons of macaroni
2 tomatoes
Vermicelli
4oz. of cheese
Parsley

Chop the vegetables finely and simmer them in the stock. When they are nearly cooked add, if desired, the macaroni, the tomatoes sliced finely, and vermicelli. Boil the soup until these are well cooked. Season it to taste and add chopped parsley. When serving the soup add the grated cheese.

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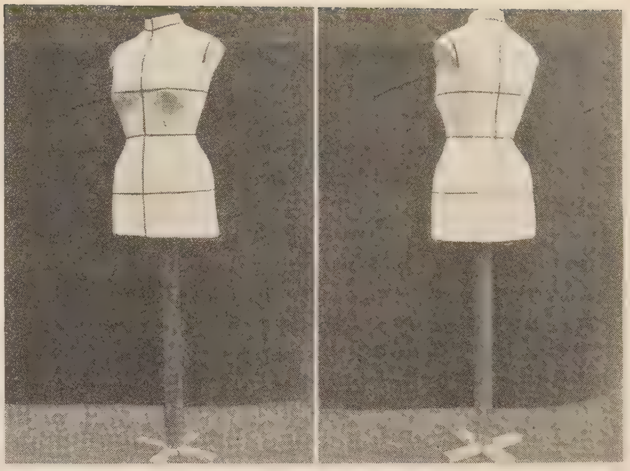
MAKING A DRESS FORM

EVERY home dressmaker at some time has been faced with the problem of fitting a dress on herself with no one to help her and knows how nearly impossible it is. The problem can be solved by making a dress form, fitted on herself so that it is the same shape and size. On this she can fit all her frocks with ease and confidence. An added advantage is that a dress form does not tire with standing still while being fitted. This article by Eirene E. Unwin, Rural Sociologist, Department of Agriculture, Dunedin, describes and illustrates how to make one very cheaply at home.



Two views of the completed dress form on its stand.

MATERIALS needed for the dress form are:—

About 4yds. of circular-knit cotton stockinette, such as is used for frozen-meat bags. If circular-knit interlock is obtainable, it is better for the final cover, in which case 2yds. of stockinette and about 1½yds. of interlock are sufficient.

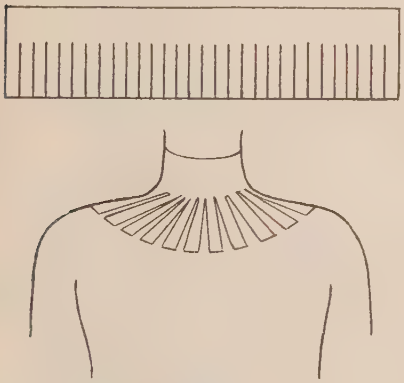
Two rolls of gummed paper, about 1in. wide and 6in. in diameter. The thinner paper is better than the thicker, as it moulds better, but it should not be too flimsy. If the rolls are about 8in. in diameter, one is sufficient, and if the paper is thin, not all of the two 6in. rolls may be used.

A wooden stand on which to mount the completed form. Brief directions for having this made are given later.

A small tin of varnish.

About 5yds. of narrow black tape.

Equipment needed consists of as many pairs of scissors as workers (at least two), a yardstick or a long smooth stick on which marks may be made, a tape-measure, needle and thread, a basin of warm water, and cloths for damping the gummed paper.



The foundation should fit smoothly well up the neck. If the stockinette does not reach sufficiently high, a strip of stockinette or muslin must be cut and fitted as shown. It may be sewn or stuck with gummed paper to the top of the foundation.

Throughout this article the person on whom the form is being made is referred to as the model. She should have at least two assistants to model the dress form on her.

Fitting the Stockinette

The model should wear low-heeled, comfortable shoes, but not slippers. She must stand for about an hour, so comfort is essential. She should also wear a well-fitting foundation garment and stockings to hold it down smoothly, and over this she puts sufficient stockinette to be fitted close up round her neck and to reach well down her thighs—at least 12in. below the waistline. A length of petersham pinned fairly tightly low round her waist beneath the stockinette is a good idea. It does not become part of the dress form so may be used again afterward. It helps to prevent the waist from being made too big and makes the figure slightly low waisted. As dresses fitted on the form tend to slip a little lower on it than they do on the figure, making the form slightly low waisted usually results in the dresses fitting the natural waist exactly.

The stockinette should be cut on either side to fit round the arms and fitted smoothly over the shoulders and up the neck. The seams should be made as flat as possible, though particular neatness is not necessary. If the stockinette does not come high enough up the neck, a straight strip of muslin about 6in. wide and long enough to go right round the neck may be cut as shown in the diagram on this page and fitted on smoothly; this also should be sewn smoothly.

It is important that the whole foundation, to which the gummed paper is stuck, should be smooth and neat fitting.

From the roll of paper cut nine strips 40 to 45in. long, and cut the rest into pieces varying in length from a few inches to a little longer than a foot. A quick way to do this is to cut right through the roll with a breadknife from the outside into the middle. A number of the fairly short pieces should be cut to half their width for the neck and shoulders.

The room must be warm, for with all the evaporation that occurs when the model is partly covered with damp paper she is likely to become quite cold.

A convenient place to work is near the kitchen table, as the simplest way of damping the gummed side of the paper is to lay it on a flat surface and rub the damp cloth over it. This means that a certain amount of gum gets on to the table and, though it is easily washed off afterward, it is as well not to use a polished table. A little practice shows how damp the cloth should be; if it is too wet or too dry, the paper will not stick properly. A bowl of warm water should be kept at hand to rinse the gum off the fingers and to redamp the cloths.

If the model becomes weary during the process, she may support herself with her hands on a chair back or on the table edge in front of her. She may lean slightly forward, but must rest on both hands; resting sideways on only one hand would raise one shoulder and make the dress form crooked. She should stand squarely on both feet and must not drop one hip or otherwise make her body crooked until the dress form is removed from her. She should hold her head well up so that the dress form has a good shape at the front of the neck and a straight back.

With the preparations thus far advanced, everything is ready to begin the modelling.

First Layer of Paper

Begin by sticking one of the long strips down either side of the centre front and centre back about ⅛in. apart. Stick one round the waist, fairly tightly, again preferably a little below the waist, and two crossing from each shoulder, down under the bust, and round to near the waist at the back. One may also be stuck round the bust and another round the lower edge of the foundation as far below the waist as required; the form is best made fairly long, so the last strip should be as low as possible.

So that the form may be removed easily when the modelling is completed, the gap down centre front and centre back must not be covered. Each half is covered separately.

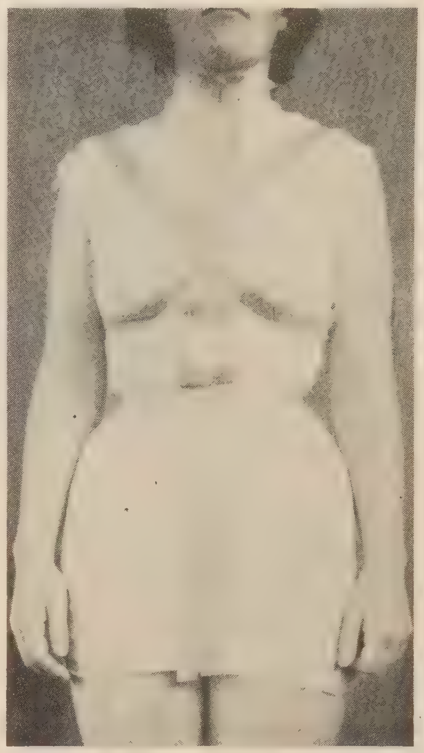
MAKING A DRESS FORM

There is no one way in which the paper must be stuck on, but as far as possible the assistants should work evenly, on opposite sides of the model, so as to make the form symmetrical. The aim is to get the paper modelled smoothly on to the figure, and in general diagonal placing of the strips is best. Each strip must be lapped about two-thirds over the previous one. The following order is a good one, though no doubt others may be worked out:

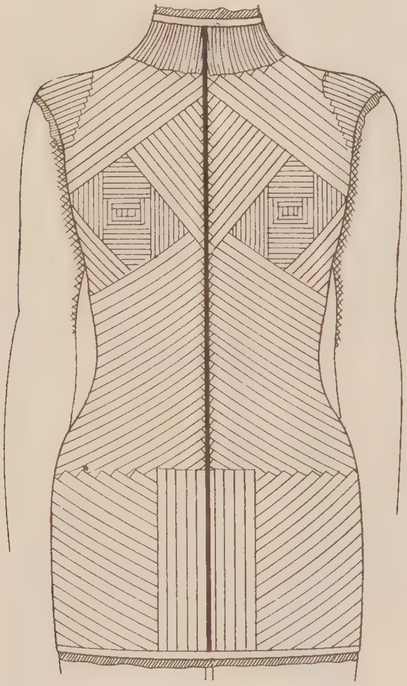
For the front, start a little to the back of the shoulder and paste strips on sloping down to the centre front. For the back slope the strips outward from the centre down to below the waist. If the strips are stopped at the waist and the lower ones begun there so that the ends overlap, the waist measurement tends to be thickened, which must be guarded against throughout. Starting again at the neck, paste strips diagonally from centre front to the underarm or to the edge of the armhole. In this way the area outside the bust may be covered.

Round the bust the half-width strips of paper will probably need to be used. The bust should be moulded carefully and, if necessary, the strips of paper snipped in from the edges round the curves so that they fit smoothly and do not make points or bulges that should not be there.

Below the waist the strips again run from the sides down toward the centre front and centre back, though vertical strips can often be used for 2 or 3in. on either side of the centre from below the waist to the lower edge. This lower edge need not be exactly even at this stage, as it is trimmed and covered later.



The model wearing the foundation of stockinette and the basic strips of gummed paper. Another strip may be placed round the lower edge. Apart from these basic strips, the space up the centre front and centre back should not be covered while the form is on the model, except for final strips round the neck and lower edge.



A suggested plan for placing the first layer of gummed paper. Half-width strips are used for the shoulders, bust, and neck. The spaces up the centre front and centre back are crossed only by the strips round the neck and lower edge.

Finally finish off the neck and shoulders with narrow vertical strips. The shoulder cap is only just covered.

The diagrams on this page show the suggested placing of the strips, but it is by no means essential to follow this pattern. It may be found necessary to work from the centre down and outward again below the hips, and the final effect will not be as neat as in the diagram. (When the form is off the model the second layer of strips may be placed in a more careful pattern.) To finish off the first layer a single strip may be placed over the ends of the others round the neck, round the shoulder cap, round the lower edge, and perhaps round the base of the neck.

The important points to remember are:—

Overlap about two-thirds of each strip with the next.

Mould carefully to the shape of the body.

Do not cover up the space down the centre front and back.

Work evenly on opposite sides so that the figure does not get out of shape.

Use narrow strips where there are extra curves to mould over—on the bust, neck, and shoulder cap at least.

Be sure that the points of the bust are equal distances from the middle line and in line with one another. This part can easily be made unsymmetrical.

If the paper bulges in any place where it should not, snip the edges, push it in, and paste more over the top. This is usually effective.

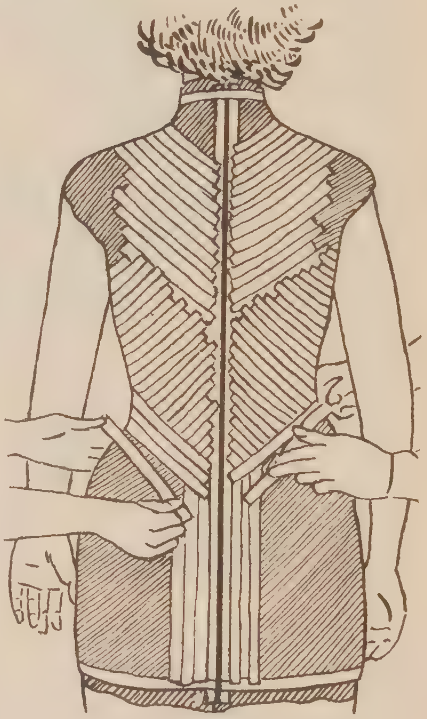
The model must stand as still and as straight as possible throughout.

The room should be warm.

Removing the Form

When the modelling is completed make several pencil lines across the centre front and back to serve as guides when putting the form together again. Using a yardstick or any other long narrow stick suitable for measuring, mark round the form at its lower edge the same distance from the floor all round. Measure this distance from the floor and write it on the form above the line and also on a piece of paper on which the other measurements of the model may be written later. Then cut the form through paper and stockinette up the centre back and, if necessary, up the centre front, and remove it carefully.

Measure the model at the neck (where the top of the form reached), bust, waist, hips, and where the bottom



There is no one way in which the paper must be stuck on, but as far as possible the assistants should work evenly, on opposite sides of the model, so as to make the form symmetrical.

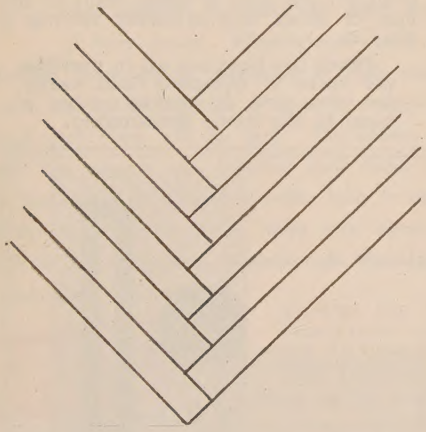
of the form reached. Measure the form also in these places and, if it is too big, trim the necessary amount off both edges at the back. If it is more than ½in. too big, cut it up the centre front also, if this has not already been done, and trim some off both front edges too. The form is particularly likely to become too big at the neck and waist, so, if anything, make it a little too small at this stage at these two places. Then, matching the pencil cross lines, stick the form together again with crossed strips of paper on the outside and on the inside.

Second Layer of Paper

Trim the neck, the arms, and the lower edges to the line, and begin the second layer of paper with strips folded over these edges, from outside to inside, and using the narrow strips for the neck and armholes. Again overlap each strip at least two-thirds over the previous one as for the first layer.

Complete a second smooth layer of paper over the whole form, this time taking the strips right across the centre front and back lines. This layer is made neat if the strips are put on each side alternately—that is, a strip on one side and then the corresponding strip overlapping the end of it on the other side, as in the diagram below. If the form tends to sag while the second layer is being put on, stuff it with crumpled newspaper. A piece of string tied round the waist is sometimes also a help. If any part seems weak when the second layer is complete, stick on some extra paper underneath to strengthen it.

When the gum has dried thoroughly the whole form should be very firm. If it is not sufficiently strong, as may be the case if the paper is too thin, a third layer may be put on, either inside or outside. The measurements should be checked again before deciding to put this third layer on the outside. The form is made still stronger and more durable if it is given a coat of varnish when it is quite dry.



The placing of the strips down the centre front and back to make a strong, neat finish when the halves of the form are put together and the second layer is being applied. The strips are placed on each side alternately, each strip covering the end of the previous one on the opposite side.

The dress form with the second layer of strips applied. The strips are folded over the edge on to the inside at the neck to make the edge firm and smooth.

Covering the Form

Most people like some sort of material cover over the form so that they can pin materials to it. Another layer of circular-knit stockinette may be used, though this tears with use and tends to sag if heavy materials are pinned to it. Circular-knit locknit, if available, would probably be better, but whatever is used it must fit the form closely and smoothly. Lumpy seams or folds of material are like badly fitting underclothes and spoil the set of the dresses made on the form. The advantage of the circular-knit fabrics, whether stockinette or locknit, is that they are very elastic and stretch to fit the form without the need for many darts or pleats. The only seams needed are up the shoulders.

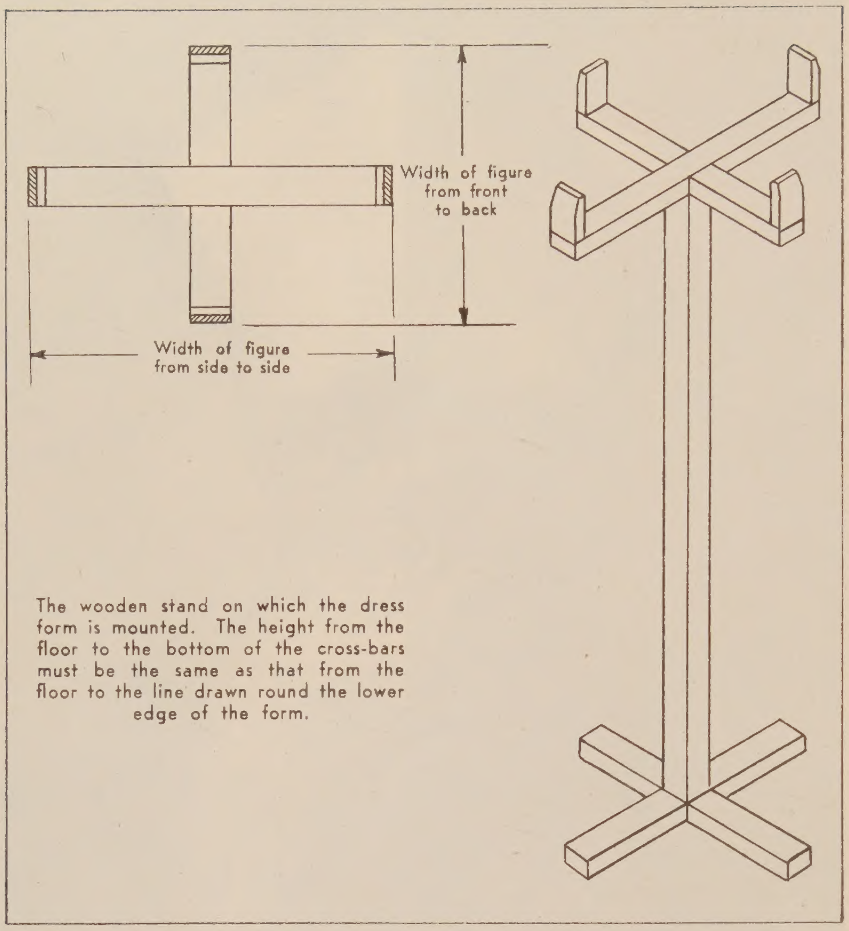
If stockinette is used, it may be put on the form before the varnish is quite dry, when it will stick to it slightly. This needs at least two people, or it is nearly impossible to get the stockinette even and smooth. As far as possible the lines of the fabric should be vertical up the centre front and back of the form; if they are crooked, fitting is more difficult.

Mounting the Form

The covered form is mounted on a wooden stand of the type shown in the diagrams on the next page, so that the shoulder height of the form is the same as that of its owner—that is, the stand must be the same height from the floor to the bottom of its cross-bars as the line drawn round the lower edge of the form.

It is necessary to know the measurements of the model from side to side and from front to back at the level to which the bottom of the form came so that the cross-bars of the stand may be made the correct length. To take these measurements hold two rulers parallel, one on either side of the figure at the right height, and measure the distance between them. Repeat holding the rulers one at the front and one at the back of the figure at the

MAKING A DRESS FORM


Width of figure from front to back
Width of figure from side to side

The wooden stand on which the dress form is mounted. The height from the floor to the bottom of the cross-bars must be the same as that from the floor to the line drawn round the lower edge of the form.

same height. These measurements must, of course, be taken on the model, not on the dress form. It is most important that the two rulers be held exactly parallel.

The form is placed on the stand over the small vertical pieces on each cross-bar. The base of the form should come down to the lower edge of each cross-bar, and it is held in place with tacks or small nails with large heads. The lower edge of the covering material is turned up on the inside of the form before it is put on the stand, which helps to hold the edge of the material up. Any loose part may be glued up or held up with strips of sticky paper.

Basic Pattern Lines

Before the form is complete it must have basic pattern lines marked on it. The best way to obtain most of these lines is described in an article on page 633 of the June, 1949, issue of the "Journal," "Measuring and Fitting for the Home Dressmaker."

The necessary lines to mark on the form are:—

Centre front and centre back, each from top to base.

Waist, bust, and hips (the widest part, usually 7in. but sometimes as much as 11in. below the waist).

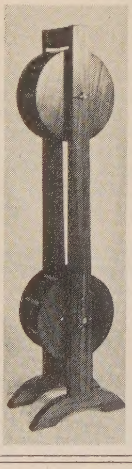
The shoulderline (from the base of the neck to the point of the shoulder).

The sleeve-cap line (where the sleeve seam of the frock should come).

The neckline, which at the back should be straight round the base of the neck, from the top of one shoulderline to the other; it should not curve down in the middle, but it will curve down a little across the front.

These lines may be made of narrow black tape, braid, or stretched bias binding. They should not be wider than about 3/16in. The lines must be held firmly to the form, and probably they are best sewn on right through the form. Sewing them only to the material cover is not satisfactory, for if this were to sag or slip, the lines would alter their positions, which would make them useless. It may be found easier to sew them on before the form is fastened to its stand, though getting their positions right is easier after the form has been mounted, for then it can be steadied with a foot on the base of the stand. Strong black cotton should be used, and a strong needle is necessary, as pushing it through the form is quite hard. The stitches should be very small on the right side, but may be an inch or so long on the inside. Alternatively, the tapes may be glued in position, but glue is messy stuff at the best of times, and probably sewing is simpler.

When the lines are all in position the form is complete and ready for use, and it should prove a boon to the home dressmaker.



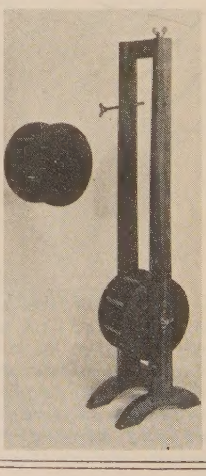
A Simple Woolwinder

THE wooden woolwinder illustrated is sturdy and easy to make. It stands 34¾in. high and is 5¾in. wide.

The materials needed are: Two uprights 32½in. long x ¾in. thick and tapering from 1½in. wide at the top to 2⅜in. wide at the bottom: two cross-pieces 4¼in. x 1½in. x ⅞in.; four discs of 5-ply 8in. in diameter: 16 pieces of ⅜in. dowelling 3½in. long: two 5/16in. or ¼in. bolts 6¾in. long: four brass wing nuts.

The winding wheels are made by joining each pair of discs with 8 dowels to give a width of 4in. between the uprights, which are joined by the cross-pieces. The top winding wheel is suspended 5¾in. from the top of the uprights. Four holes are bored through each upright to take the lower bolt, the lowest being 6in. from the bottom of the uprights, and are spaced 1in. apart. These four holes allow adjustment for winding skeins of different lengths. The base supports for the uprights are 10in. long. Curved supports as shown are not essential.

The wool is placed in the winder by unscrewing the bolts and taking the wheels out as shown in the illustration on the right.



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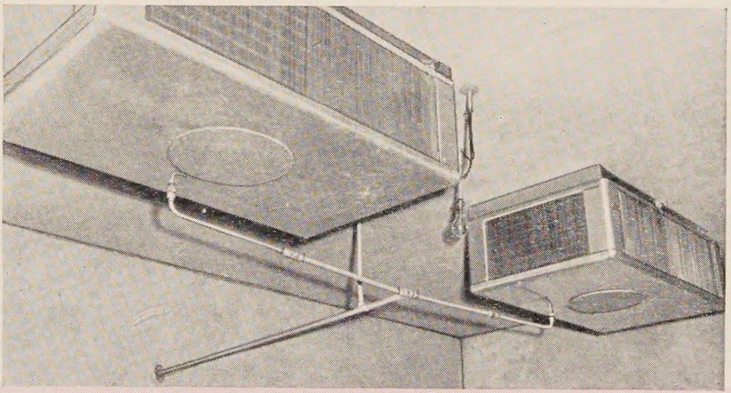

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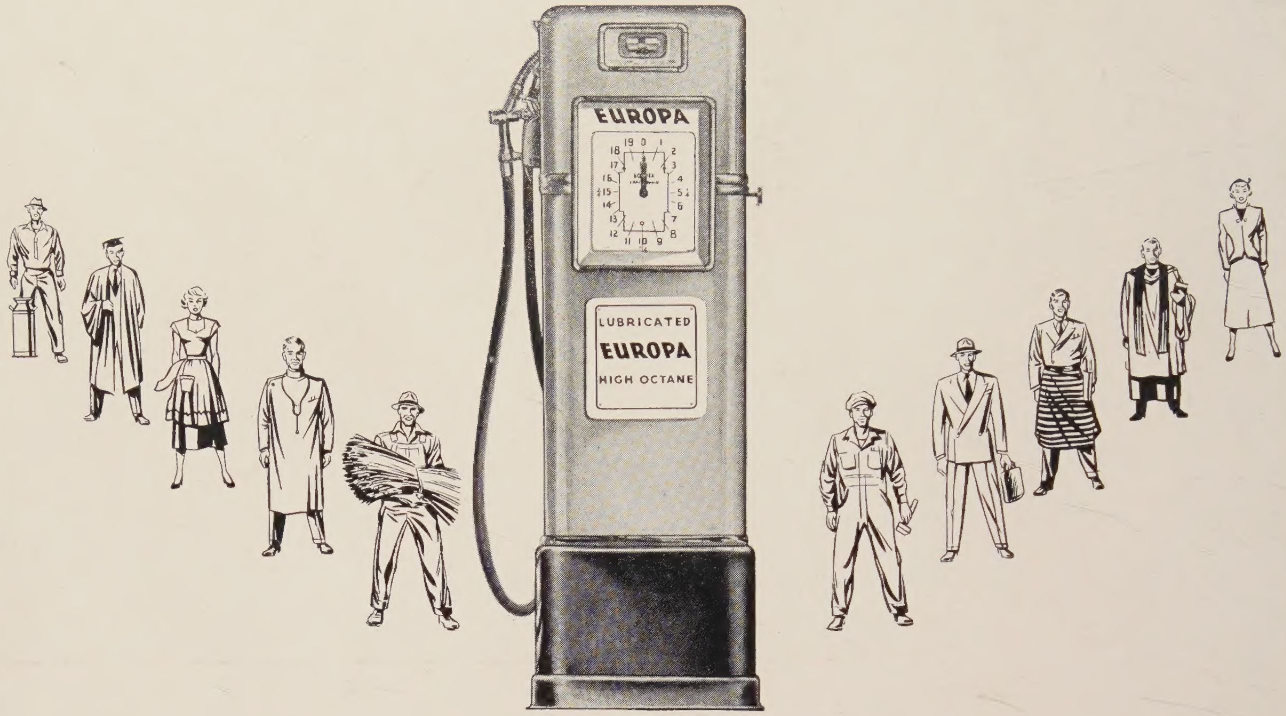
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